April, 1945 Periodical Vol. 34, No. 4

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

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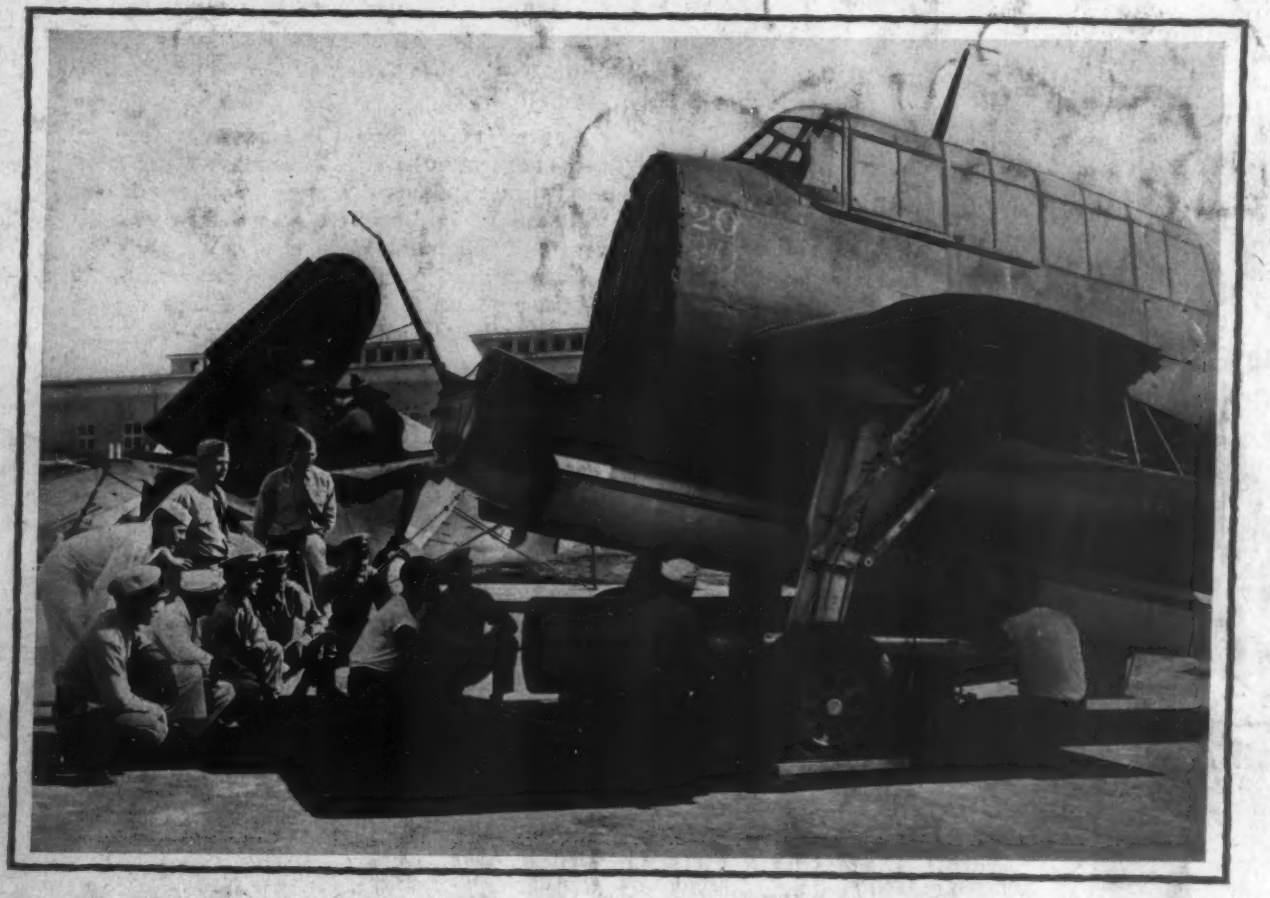

The Shop Teachers' Professional Magazine

Yes Sir - we SAVED 10 HOURS on this job!

"Instead of knocking down the cutter and arbor set-up for this straddle-milling job, we did the sensible thing—we kept the complete set-up intact, ready for the next production run. The initial set-up required 10 hours . . . so we'll again be saving that much time on the next lot."

9 surfaces milled simultaneously and held to accurate distances.

Straddle milling job on Kempsmith Type G Milling Machine.

Today, especially, it's vitally important to conserve production time. It takes many hours to reconstruct multiple cutter assemblies. Save this valuable time by laying aside the complete set-up for the next run. Have an extra supply of arbors on hand for this purpose. Remember, arbors are "perishable" tools and their cost today is relatively small. That's why —

It always pays to SAVE THE SET-UP!

Kempsmith Arbors are available in all popular sizes and types, adaptable to any make of milling machine with standardized spindle. Mail coupon for literature.

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1821 S. 71st STREET MILWAUKEE 14, WIS., U. S. A.

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Precision Built Milling Machines Since 1888

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Detroit Public

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given practical training with SOUTH BEND LATHES

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Illustrates in full-color and describes South Bend Engine Lathes and Toolroom Lathes with 9", 10", 13", 14½", and 16" swings. Also, Precision Turret Lathes with ⅝" and 1" collet capacities.

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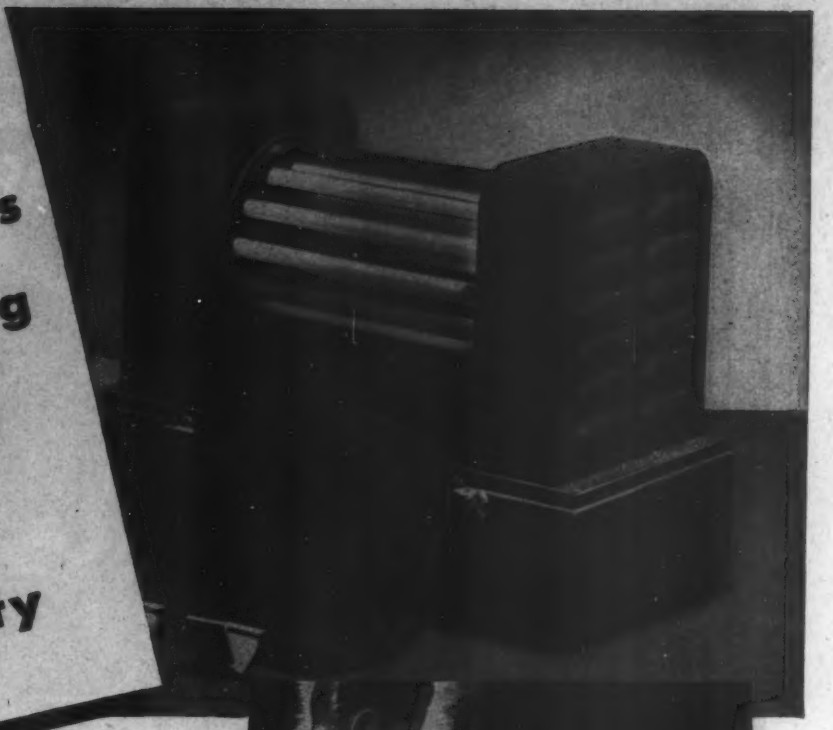

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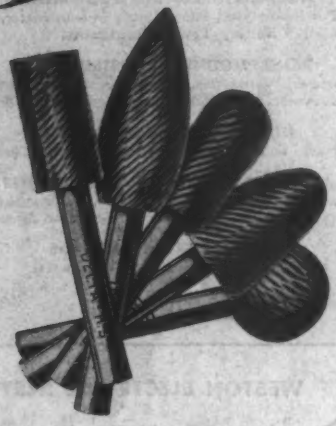
in action



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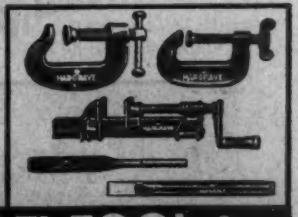

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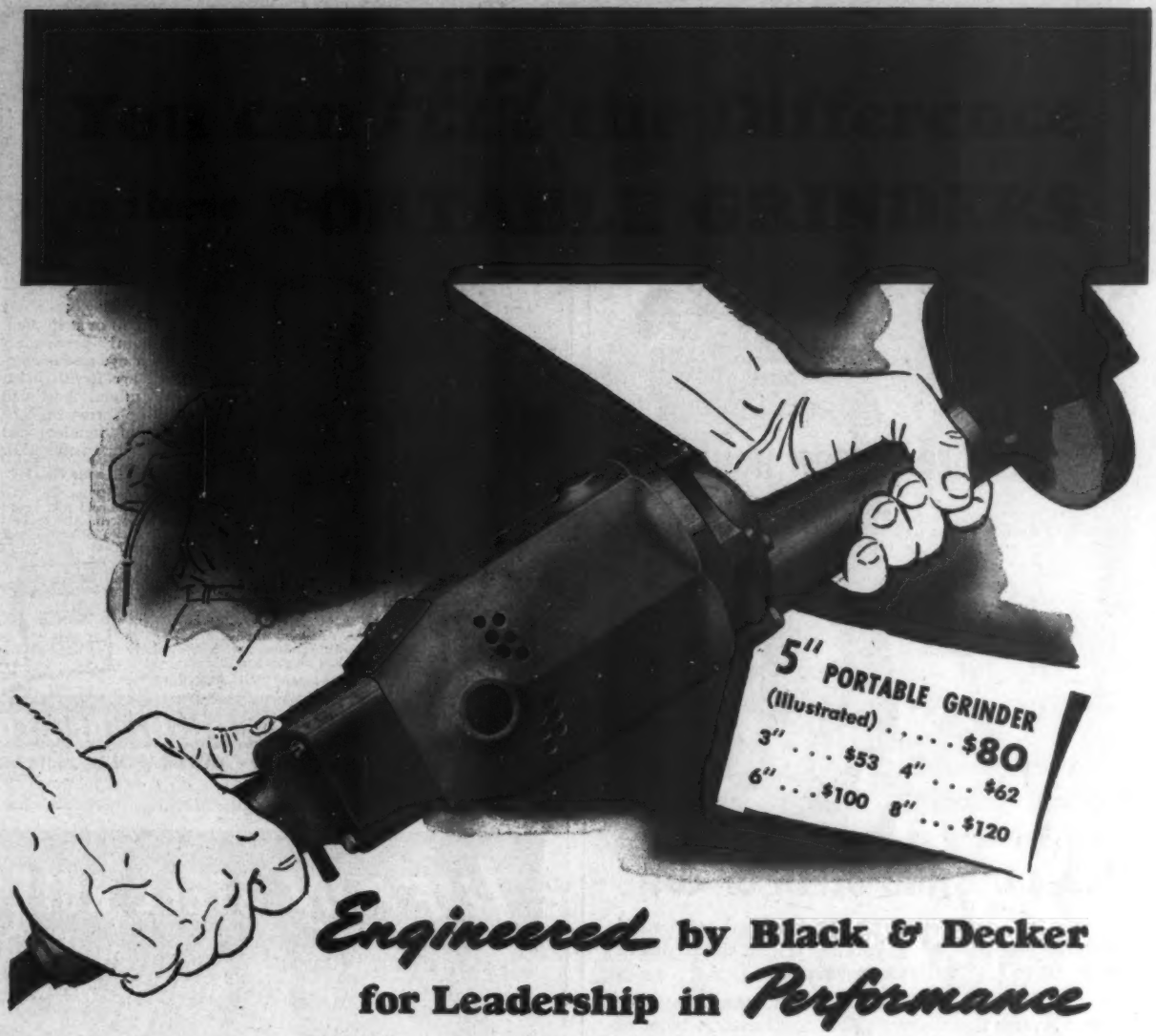

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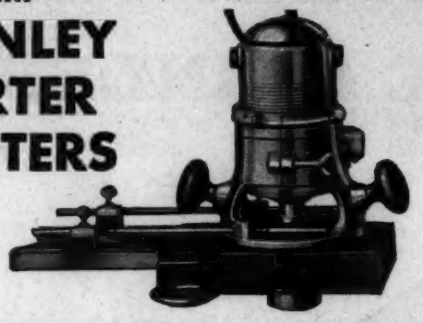

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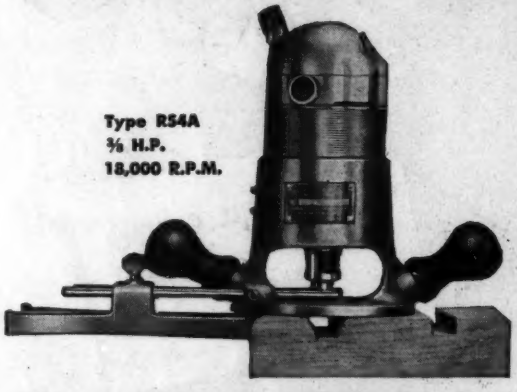

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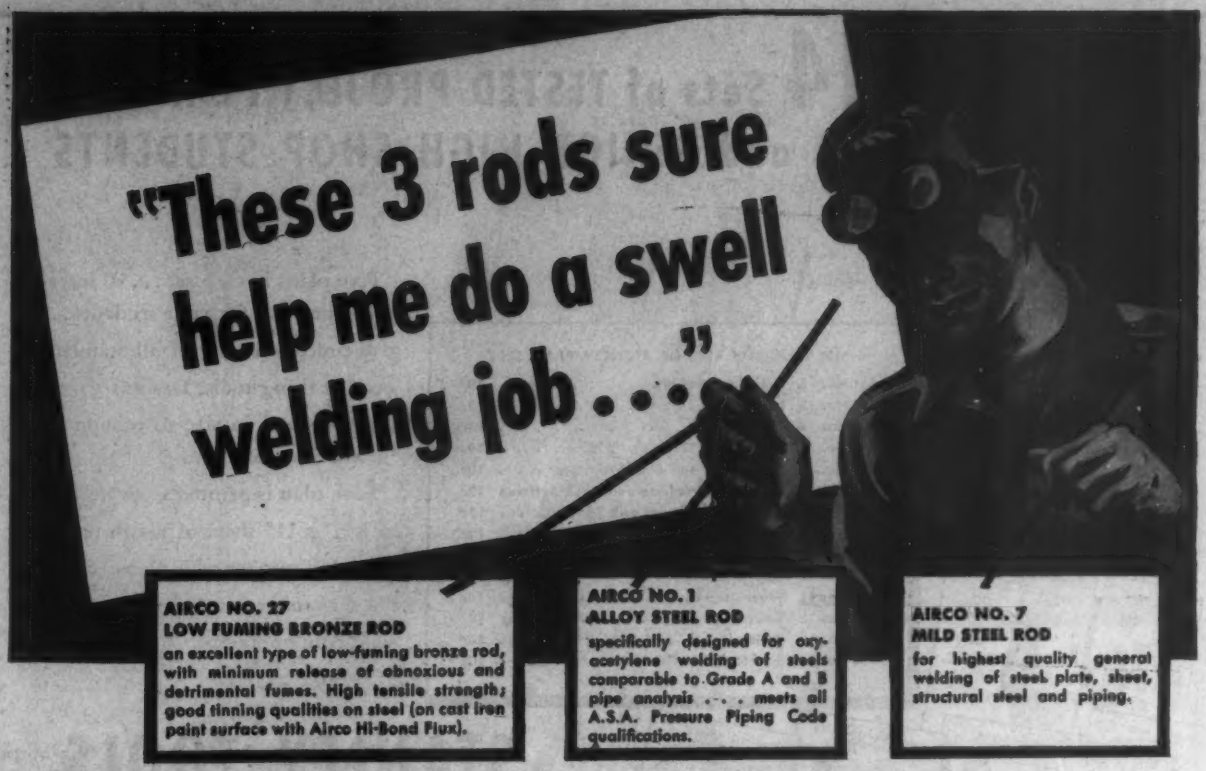

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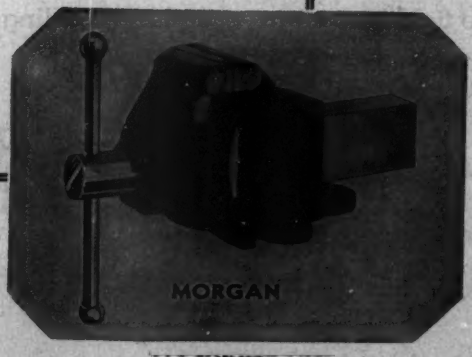

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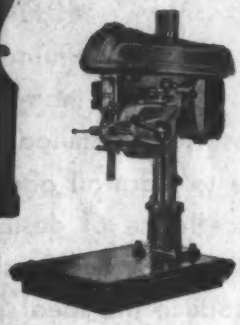

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• Have your pupils examine any one of the many Millers Falls Bench Planes. Have them look it over from every angle to learn all about a quality plane.

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Paramount Band Saws

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Accurately made Band Saws of extreme toughness enables more work to be produced in less man hours.

All sizes are carried in stock for prompt shipment.

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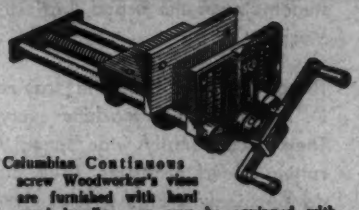

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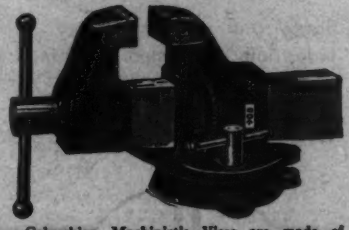

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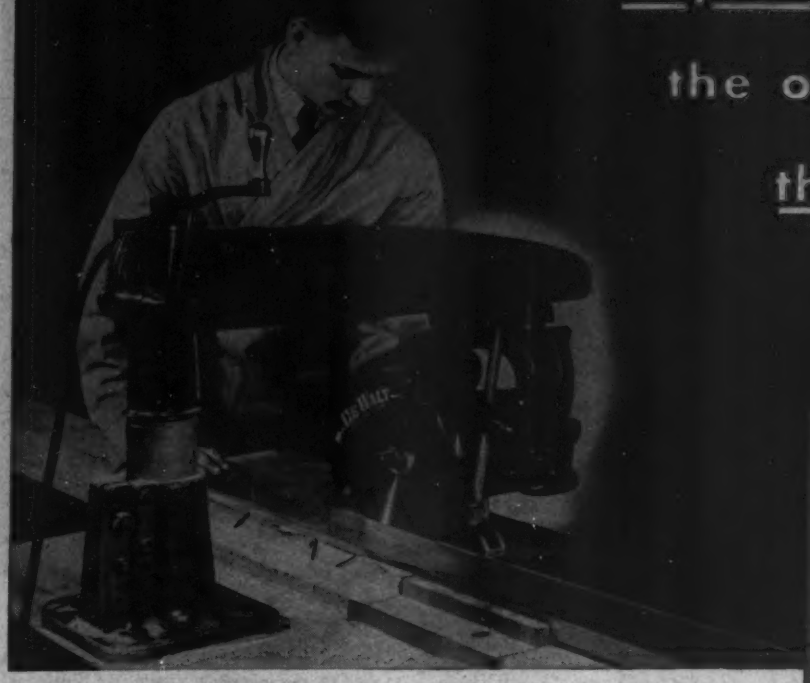

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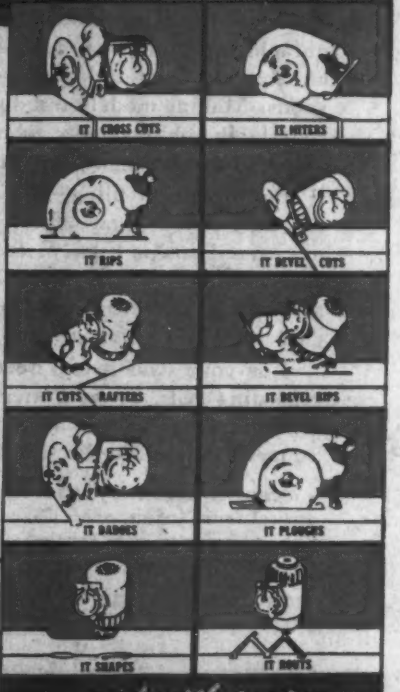

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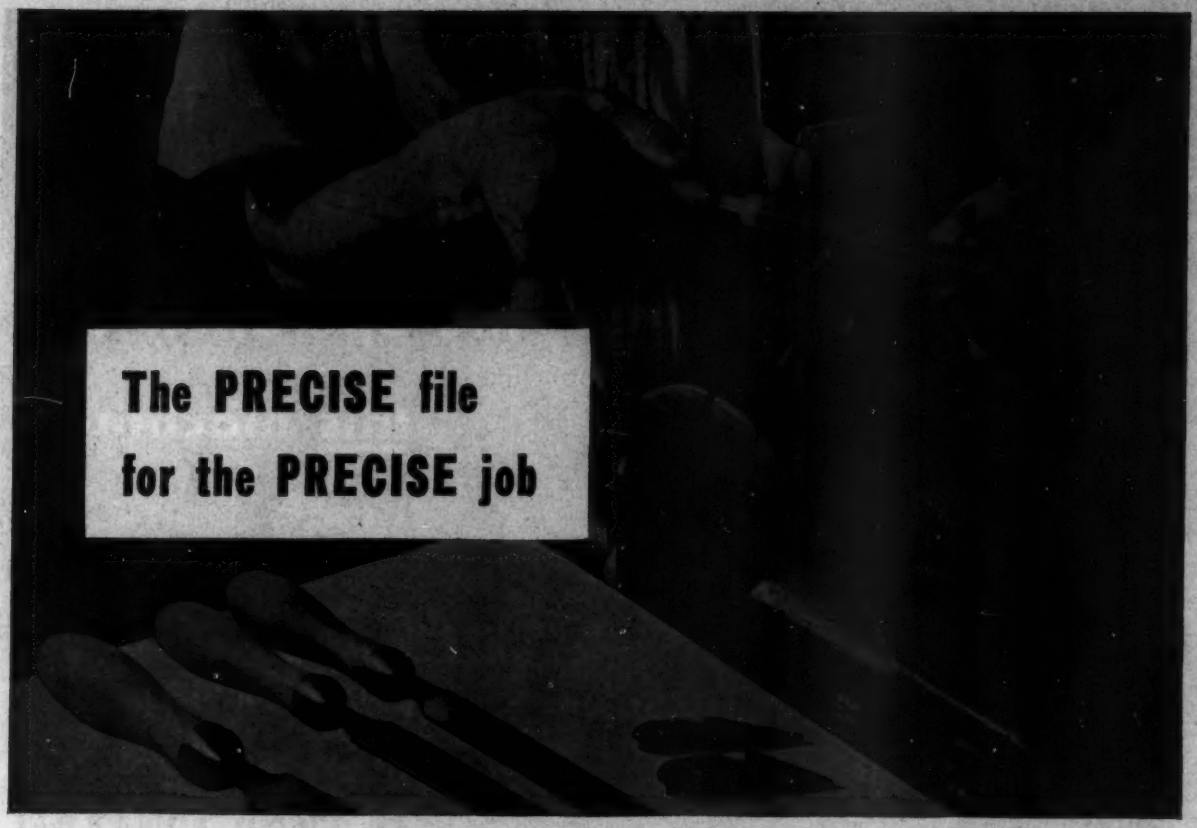

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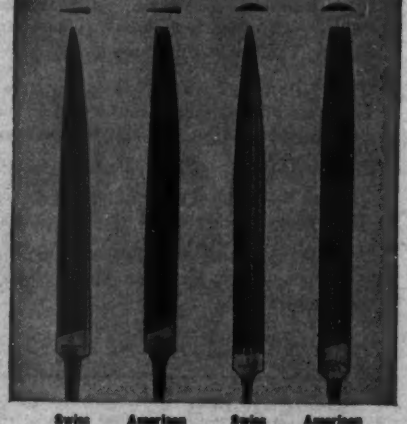

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4. Wear goggles wherever there is danger of flying particles.
5. Avoid wearing loose clothing, flowing ties, and gloves, while working at or around moving machines.
6. Stay away from in front of moving objects of any kind.

— Adapted from the Power Press Safety News Letter

Things to Do in March

• Take out your 1945 Red Cross membership.

• Get your 1945 Easter seals. This is the twelfth annual sale. It is sponsored by the National Society for Crippled Children and its affiliated organizations, and is conducted from March 1 to April 1.

The proceeds from the sale of these Easter seals help to finance a national program for the care and education of crippled children.

• Help and contribute to the United Nations Relief and Rehabilitation Administration's collection of clothing for the 1945, Spring overseas war relief drive.

In Europe alone there are 125,000,000 men, women, and children who are in desperate need of clothing, shoes, and bedding.

This drive is to provide these people with 150,000,000 lbs. of serviceable used clothing.

This Month's Cover

The picture chosen for the cover of the April issue shows an instructor training class observing a line activity. Naval Air Technical Training Center, Memphis, Tenn.

BUY ANOTHER WAR BOND

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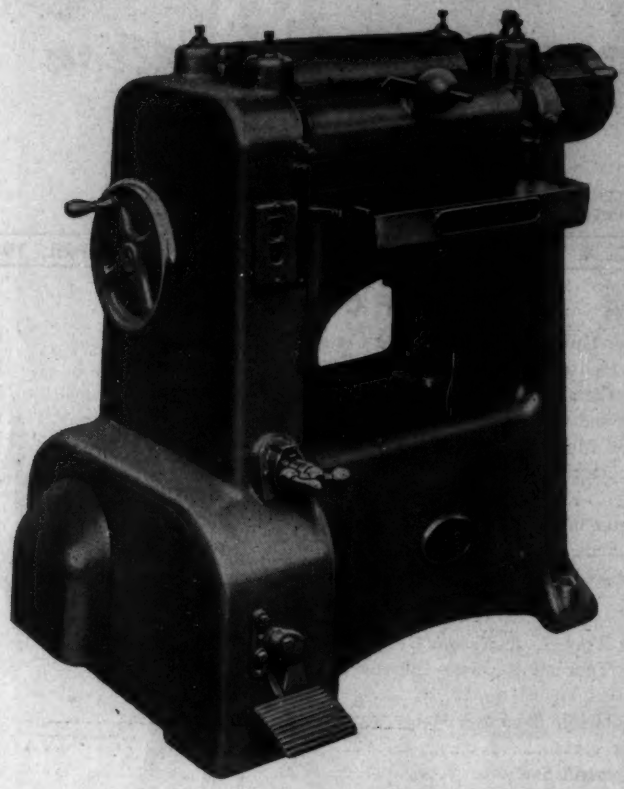
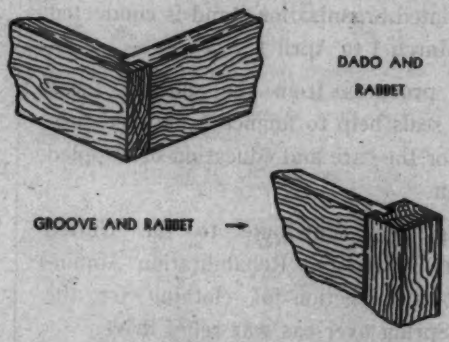


J-18

SURFACER

No. 7 of a Series

JOINTS AND THEIR USES



RABBET-AND-DADO JOINT

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Of all accidents to pupils of public schools only about 14 percent take place in school shops. One reason for this relatively low rate is perhaps the safety consciousness that exists among instructors and students. Both have grown to realize the tremendous importance of acquiring safe work habits.

Another contributing factor, no doubt, is the care and attention which many manufacturers have given to safety in designing their shop equipment. Especially is this true at Yates-American. Here every effort is made to design woodworking machines which will prove safe, even in the hands of operators of limited experience and skill.

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Better Bases for Guidance

*John Edmund Crawford**

Counselors more and more are recognizing the significance of scientific psychology and psychological test data as bases for guidance. Many a counselor long has entertained a secret ambition to set up a laboratory where at least a few of the available good test materials might be at hand to throw their light on guidance problems. In the past decade many schools have had to make deep budget cuts, so this ambition has often remained just a vision. During these same years, the lay public has increasingly criticized the school for being unable to do the best piece of guidance on Bill and Mary.

It seems about time the school answered these critics by asking for some adequate psychological test services to help it do the task everyone knows it wants to do. Educate children? Yes — but do the job in the most practical and most efficient way. Educate Bill and Mary to do the best job of living in this America of ours, yet educate them with the least possible waste of money, time and energy. This challenge confronts psychology as much as it faces the school. It most likely will be the applied and clinical psychologist who will accept the challenge and *do* something about the problem. The present national and world situations only more vividly show up this problem and add force to the growing demand for its solution.

This job of educating Mary and Bill is a serious one, probably understood and comprehended by their families as little as by anyone — chiefly because it is so easy for us to confuse our hopes and wishes for these children with the actual facts about them. Maybe just such a confusion lies behind the very low correlations usually found between education ambitions and final vocational choices or levels. At any rate, these strikingly low correlations, often near zero, ought to have been like red signals set against the express engineer rushing into trouble. But we merely smiled, with certain inflections meant to disparage statistics and facts in general as not pertaining to our own children. Even Bill and Mary have sometimes vaguely sensed the situation before some of the rest of us.

Plans for greater flexibility and integration in the curriculum will not, in themselves, rectify the situation. In fact, as courses and subjects multiply, the danger of wrong choice increases rapidly, unless some very excellent guidance precedes the choice. Maybe our children do need more education than they now are scheduled to get; the trend nationally is toward prolonging the years in school. On the other hand, mere exposure to some lengthy educative process does not necessarily produce intellect in a boy whose capacity does not warrant these expenditures. The possibilities of waste in misdirected energies and capital, already inherent in our present educational system, can only increase, unless we take steps to cut down the accidents by which children often are encouraged, permitted, even compelled to submit to years of education which are unrelated to their needs and capacities.

Hopeless? No! Much can be done right now by starting in every school a psychological testing service and laboratory which will supply a scientific basis for adequate guidance.

Facts Replace Guesses

Without reliable educational guidance, there can be no reliable vocational guidance. Only by replacing guessing with psychological measuring of mental abilities can any kind of guidance really be carried on successfully. The counselor's duties must be preceded by those of the psychologist. Such a psychologist-counselor setup becomes as valuable a part of the school as any phase of its administration. To the community at large, this new unit has by-products that are invaluable. Any agency that directs lives into their most useful and efficient channels is an asset to the community.

In the proposed psychologist-counselor scheme, the two offices must be articulated even to the extent of being within the same unit. Each shall have its own area of specialization, however. The psychologist is expert at giving the needed tests and interpreting their results. The counselor has enough of a task if he keeps ahead of the rest of the job, with its many ramifications these days. Where these loads are not great enough to demand the full time of two persons, the combined job may best be given to the psychologist.

Background for the Job

However the administrative details of this new guidance unit are arranged, certain functions must be present in it. The staff must have very wide knowledge of the real world, and this is no mere academic or vicarious manner. An intimate contact with the adult world of life and work into which Bill and Mary will some day have to step, a knowledge gained only by *participation* in this world, stands the real counselor in good stead with those who seek his advice and help. Opinions and theories never weigh as much as facts, with these boys and girls, especially firsthand facts. Both counselor and psychologist on this job must foresee the changes now only hinted at in industry, in schools, in the demands on society. There is some truth in the idea that "the best preparation for tomorrow is doing the best job today," but we have no right to infer that sudden changes in our technocracy cannot completely upset plans which have not involved the element of adaptability. Five years spent out in the industrial world is not too long a time in which to get this kind of a background.

An equally paramount knowledge of the growing child is fundamental to the job. The fact that some aspiring applicant has raised a child or two must not be mistaken for a wide and practical knowledge of all the many other kinds of children that exist. The various phases of childhood, the many perplexing problems of children, their common and their uncommon behavior patterns, all the intricate complexities of growing up in this kind of a world where they are — these are the substance of this phase of the background for doing this job. Some of this can come from between book covers, but most of it will have to come from wide life contacts with children of all sorts and in many circumstances. This may take years to accumulate, from such places as teacher, scout work, court work — the wider the better.

The school psychologist must be expert in testing, gained though extensive clinical practice, dealing with many types of cases extending from the purely educational problem to that of institutionalization. Over and above this technical ability, the psychologist must be tactful and pleasant, so that he can reach the secret and perplexing situations behind a problem. Sometimes he will need to withhold the exact findings he has on a case; in other instances he may want to give special tests to probe other areas. To be able to do these things in a professional manner will be at times his best asset. Of course, all data and conferences are always held in the strictest confidence, as befits the job. All these things go to prevent unworthy connotations and reactions to the program.

What Tests to Use

The choice of the measuring device is determined by the accuracy and fineness of measure desired and by what characteristic

*Trenton, N. J.

the measure must indicate. In psychological testing, the statistical factors of validity and reliability of the test are also very important about any particular test. Only the most accurately and carefully standardized tests should ever be given consideration in any laboratory or school. Poor tests are often worse than guessing — at least as bad. The psychologist is amply capable of organizing the program around the best batteries of tests available, adding new tests when they prove valuable and are reliable.

Group tests can be put to use on many general problems in the school, such as checking the reading level or making a rough survey for certain mechanical aptitudes. A good group test of general intelligence, such as the Kuhlman-Anderson Intelligence Test, is one of the psychologist's better instruments. For many problems, however, individual tests are necessary for complete diagnosis. These include such tests as the Terman revision of the Binet, the Kuhlman-Binet revision, and such tests as those in the Minnesota Mechanical Aptitude series. Eventually the clinic may possess such instruments as the Betts Ready to Read Tests. In the beginning, tests such as the Durrell or Monroe Reading Analysis Tests, Gates Silent Reading Test, Hildbreth Arithmetic Achievement Test, and so on, may be made to serve many testing problems quite efficiently.

Each test is designed for a specific use. Depending on the particular problem, tests may be chosen to show up the various details of a total case so that correct prognosis and recommendation can be made. In any case, a few hours spent in sound psychological testing by the expert can save years of educational waste with all the implied maladjustment in adult life.

A valuable by-product of any test program in a school is the various normative and comparative data that soon begin to accumulate. These soon show a very graphic picture of many phases and aspects of the school. Internal research of this kind is healthy for the school, permitting fair, unbiased checks on methods, placements, and individual adjustments.

All test data, case records, and recommendations should be kept in a safe place for reference. The accumulative record becomes a greater aid, as years advance, to guidance. The writer has in mind the psychological records of a boy now in college, which were begun when he was in grade II. By grade VIII, guidance was a simple matter, based on the data then available in addition to his school marks. Step by step, these data have done a splendid service to the boy in his school life. Every parent will welcome this kind of guidance for his child, once he perceives that it is really scientific.

For example, when the problem of grade placement appears, the psychologist can give such tests as permit interpretation in such terms as I.Q. and M.A. Such data provide a sound foundation upon which to base decisions of grade and group placement. Classification may be based on a three-track scheme such as the Trinidad Plan, devised by Corning (1).** A similar plan has been advocated by Terman (2).** Briefly, in such plans the child is placed in the grade that is normal for his mental age, and within this grade he is located in the slow, normal, or fast section according to his I.Q. Of course, special placement of very dull and very bright children is necessary to avoid certain social difficulties arising.

The very bright or very dull child does not vary from the average so much in the kinds of abilities possessed as in the degree and capacity for these abilities to develop. Better intellects have a higher uniformity of abilities than duller ones. Better brains can integrate and abstract much better than poorer ones, regardless of training to that end. Many dull children are forced or urged to dodge and fumble through standard courses in many a school, in an erroneous belief that if the slow mind is exposed long enough to "certain forces," it will at least come up to normal. And sometimes very bright children pass through these same schoolrooms without hardly ever having worked up to their real capacity and level of ability. The few bright children who succeed in keeping near their maximum mental level of work and study and growth in skills often do so in spite of the educational situation about them. Most of them discover early all the easy, soft ways to get through life; seldom do they long remain fired with real ambition. If the new testing laboratory in a school can begin to do something about these boys and girls, its future is assured.

Personality patterns that lie behind adjustment problems are often very difficult to discover and diagnose, but they are not impossible to remedy in most cases, when brought to light. The peculiar problems behind truancy, stuttering, depression, exhibitionism, for example, cannot be discovered as readily as through the adept use of certain tests of personality adjustment. The psychologist can diagnose these behavior deformations in the early stages before the maladjusting mechanisms spread further into other life phases. Play situation can be set up for smaller children, for example, which will illuminate some of the issues behind personality problems and thus provide data for a practical basis of re-education.

The classroom teacher, in the ideal setup, will find the psychologist an able ally on the job. Adding viewpoints, pooling data, compiling evidence, they readily team up on a problem, each aiding the other. The new guidance unit can do a good piece of work by assisting school planning, course arrangement, and curriculum adjustment.

Only when the guidance, per se, is based on the psychologist's findings, is the job justifiable. There is no value in these findings if they are filed away and thought of only as "odd or interesting data" on this child or that problem. Thorndike, in his recently completed ten-year study of 2500 school children, dramatically shows that their education was carried on just as if these children had no differences in either general scholastic ability or in any other capacity. Practically no attention is given to these extraordinary facts about the maldistribution of education. Even now we are better equipped in most places to give a child ten years of what may be the wrong kind of education for him, than we are to give ten hours of expert psychological service to that child in his whole school career.

After Testing — What?

Grade I is not too early to start to compile the psychological data on a child. Some schools have established rules about entrance mental age for grade I; lower mental ages are kept in preschool or kindergarten until a sufficient mental level is attained. Certainly this is a splendid step ahead, from all angles. Let us carefully measure the child by the best techniques possible, and then let us see to it that his parents and teachers understand the educational implications of these findings. By no means is it ever fair to anyone involved to let some fond parent go along for years believing that her child finally will suddenly spurt and catch up in all his learnings, when the facts on his record card indicate otherwise. Far too much can be expected of the child in these cases for his best development at his own level. Sometimes it is hoped that "a change of school, or having his adenoids out will do it" — or that "his great love of color and fanciful imagination, or his love of music, will make him the long anticipated artist in the family." Then sometimes the problem is laid neatly in the lap of some weary tutor who is forced to use a technique suitable to training a polly. So, grade I is never too early to begin to face facts, and lay whatever plans are laid on a foundation of facts.

We do not need to stress results of any single test too much, excluding all other relevant data about the youngster. But if we begin early enough to compile data, by the time Mary is ready for grade VI we can sensibly decide on certain important phases of promotion and classification. If her Seashore Musical Aptitude rating is high enough, and her general intelligence factor is well above average, then the sacrifices necessary in the family to provide music lessons for her in the small budget are worth all the cost. And if Bill's ambition to be a chemical enginer is backed up by the firm approval of the psychologist after he tests Bill thoroughly and reviews his records, then it is sensible to urge the boy on. But if the data indicate that success is highly doubtful, then to urge these children on toward ultimate failure or mediocrity is foolish and selfish. Better to have Bill become a good mechanic than spend his years eking out a living in competition with over half of his own profession. Joy does not stem from half-success

**See bibliography at end of this article.

any more than from failure. The frank psychological facts on a child's record may not always flatter the selfish ego of his parents, but these facts supply the most sensible basis for guiding him toward life's happier walks.

Every individual possesses certain abilities that rate above the general plateau of the rest of his abilities. The best success usually grows out of the development of these better abilities to best use in a socially acceptable area of work. This is not a fatalistic viewpoint of chance or predestination. Rather it sets a premium on the discovery, acknowledgment, and efficient utilization of the best abilities and aptitudes that life has bestowed.

Easy Beginnings

No doubt many schools and communities have put off starting a psychological testing laboratory for economic reasons. A very serviceable unit can be set up in a school — perhaps serving several small schools — at a cost not much above the item of salary involved.

The new testing laboratory can start out with one room, well lighted and ventilated, free from unusual disturbances. Here all the individual testing can be done and conferences can be held in a professional manner. Provide plenty of shelf space and files or cupboards for keeping testing materials and records in the best way for use.

A medium sized double desk, three comfortable desk chairs, a small table and chair suitable to use when testing younger chilren, comprise the furniture needs. The room decorations should be as simple as possible, yet cheery — a pleasing atmosphere that will not distract attention from the task at hand. The door might bear the word "counselor," unless the idea of "psychologist" has no connotations distasteful to the community.

Just what testing materials will be needed at first will be determined by the testing service area to be covered — and perhaps somewhat by the apportioned budget. However, the outlay for a moderate array of reliable tests and materials is far less than the money previously wasted on failures and repeats and maladjustments.

The more expensive area of the average program usually is the group testing. Such materials as Kuhlman-Intelligence Tests cost around five cents each, complete. Individual test cases will average from ten to twenty cents for materials consumed, depending on the details involved. Performance tests, such as the Minnesota Mechanical Assembly Test or the Crawford Spatial Relations Test, do not use up their materials, and last a very long time even with hard use. The psychologist may have some preferences as to which tests to use in certain cases and problems. He can suggest the most efficient tests for use in the new laboratory.

One Caution

Because prestige attaches more rapidly to endeavors which serve to distinguish the best traits and abilities of the children, any disclosure of the dull child in a way that brings the harsh ridicule or stigma may jeopardize the whole program. But sincerity and honesty plus tact will find the way around this problem. The average layman can be educated to desire and demand the blunt facts, per se, about his child; this is true even when the situation involves some "touchy" problem about the child, which the parents must first be made to see in the right light before the case can really be solved. The capable psychologist, however, knows how to bring about all these desirable interrelationships between home and school and child in the best way for all concerned.

The Next Move

Seek your psychologist and plan your new psychological guidance service unit now. Perhaps within your system or community a well-qualified person awaits the opportunity to get into this job and do it splendidly. A little advertising of the right kind will readily locate a capable person. The placement bureaus of some universities can supply a list of names of creditable school psychologists. Finding your leader is a good way to begin the new program.

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The Student's Plan of Work

Gerald Baysinger and G. Harold Silvius**

The Student's plan of work for doing a job has become an acceptable part of shop instruction. The lapse in time between the teacher's demonstration and the pupil's manipulative work at the bench makes it necessary for the student to have written directions to supplement the instruction. The use of instruction sheets is quite general; in most school systems teachers are expected to have the students work from written directions, and contributors to professional literature recommend the use of written directions in the teaching of a shop course.

Kinds of Job Sheets

The different job sheets in use might be classified as printed material for sale by publishing companies, mimeographed material prepared by teachers, and plans of work written by the students. Teachers are familiar with examples of each kind mentioned, and are aware of some of the disadvantages and advantages of each from a practical standpoint. The commercial job sheets are relatively expensive, and in some instances, could not be secured by each student. Printed material, whether mimeographed or otherwise duplicated, requires a considerable amount of teacher effort to prepare. Equipment for reproduction in quantities must be available, and storage facilities for mimeograph stencils or other duplicating supplies is needed. In using teacher prepared material there is a tendency to avoid improvements and to neglect making worth-while additions in the course of study. Teacher prepared material, unless bound, is difficult to store and distribute under shop conditions. One of the functions of the boards of education is the selection and adoption of standard text material, and there is a question regarding the use of mimeographed material which has not been officially approved.

The plan of using student written sheets offers a number of worth-while advantages. First, the cost to the student is reduced to a minimum; second, changes and improvements in the course of study are easily accomplished; third, the teacher is relieved from the work of furnishing a previously prepared job sheet; and fourth, instruction is more effective, because the writing of each step in doing the job provides additional sense impressions otherwise unused. The advantages of student written plans follow present practices in education.

*Detroit, Mich.

Types of Student Written Planning Sheets

The three types of student written planning sheets are briefly described, together with some of the advantages and disadvantages. The first type is one in which the student writes the planning sheet himself without the guidance or supervision of the teacher. The use of this type of plan results in directions which are either voluminous or incomplete. The second type of student written job sheet is that which is prepared and dictated by the teacher. The student's participation is limited to copying only. The third type is one which is developed cooperatively by the students and teacher as the instruction progresses. Student participation during the instructional period is encouraged which results in better attention and an attitude of readiness to learn. The advantages of the cooperatively developed planning sheet recommend its use.

The Student Written Planning Sheet

Form sheets prepared for use in the shop should contain a place for the "Steps in Doing the Job" plus other administrative devices such as a place for a test, references, and provision for evaluating the complete work. When the student writes his plan of work as it is developed during the demonstration, difficulty is experienced in securing the uniformity necessary for administrative purposes unless a form sheet is provided. This form intended for use by the student must contain provision for the writing of the following information:

1. *Name of the Student:* If the name of the student appears on each sheet, it enables the teacher to call the student by name while discussing his work. This is especially valuable in a large class and at the beginning of the course before the teacher has learned the names of the students.

2. *Name of the Job:* In the school shop where several activities are carried on simultaneously it is desirable to have the name of the job displayed rather prominently on the planning sheet form for ease in assignment and for other administrative purposes.

3. *Place Where the Work Is to Be Done:* In most school shops the layout is such that the equipment common to a certain activity is localized. For example, the metalworking tools and equipment are often grouped together. Obviously, the form sheet should indicate the department or area in which the work should be done. In most shops the departments are composed of a number of "places to work," which are called "work stations." A work station includes sufficient floor space, and adequate bench surface for a student to do the work assigned. Provision should also be made on the planning sheet for indicating the work station number.

4. *Tools and Equipment:* By listing the tools and equipment needed in doing the job, the student learns the correct names, he can discuss his work more intelligently, and he learns the correct spelling so that he can recognize the names of tools and equipment in print.

5. *Materials:* When two or more activities are carried on at the same time, a larger number of materials must be stocked. When the name of the material and the stock size appear on the planning sheet, the teacher is reasonably sure that the student, who starts his job some time after the demonstration has been given, will use the correct materials.

6. *Steps in Doing the Job:* Suitable lined space should be provided for lettering or writing the steps that are developed cooperatively by the students and the teacher. Lines should not be numbered, because some steps may require one line and others may require two or more.

7. *Sketching Space:* Simple line sketches are very effective in teaching layouts and in explaining tool operations. Sometimes a sketch is required as a part of the job, such as the drawing of an electrical circuit. The inclusion of an unlined sketching space is desirable.

Placing this space on the form immediately following the "Steps in Doing the Job" is an advantage, for it may then be used for "Steps" if additional space is required.

8. *References:* It is convenient for the teacher to refer the student to printed and written material for purposes of reviewing a tool operation, or for securing additional information. Most school shops are equipped with a reference library, which consists of books, magazines, trade catalogs, and personal scrapbook material. The reference which contains the information, which the teacher wishes the student to secure, should be listed on the planning sheet. When one of the requirements for the completion of each job is reading at least one reference, the student is encouraged in the formation of the habit of using available information.

9. *Test on the Instruction:* In the school shop when instruction is given to a group, the importance of effective instruction cannot be overemphasized. The operations should be demonstrated to the entire class, and if they are not taught thoroughly, confusion results, time is wasted, and student morale is lowered. The time to give a test is immediately after the instruction is presented. The questions should show whether or not the students have sufficient information necessary for the successful completion of the job. For the most part, the questions, which may be read by the teacher, should be of the single word answer type, and not more than ten in number. Correction and scoring of the tests may be done by the group, in which case, the job sheet form should provide for the signature of the student correcting the test. The advantages of this kind of testing are: first, it reveals the student who needs additional instruction before beginning the job; second, scoring the test questions reveals weaknesses in teaching at a time when remedial instruction would be most effective and could be given; third, a mark on the test is a means of giving credit for time spent during the instructional period, which places instruction time on a basis with time spent at the work station as far as the student is concerned; and fourth, the desire to secure a good mark on the test helps to maintain better attention during the demonstration.

10. *Evaluating the Student's Work:* The evaluation of the student's completed work is an important part of teaching. The evaluation must be translated into a mark and recorded in a marking form which is a part of the plan of the work sheet. In the school shop where two or more different projects are under construction at the same time it is difficult for the teacher to remember all of the facts that must be considered to properly evaluate the work of the student. To aid the teacher provision should be made on the form sheet for the listing of information which will make the evaluation part of the teaching process. These items of information which will be considered by the teacher in determining the mark on the job are:

a) Mark on the Test. This mark is determined at the time the test is given on the instruction presented by the teacher. This mark can be placed in the marking form by the student who corrects the test.

b) Student's Mark on the Job. When the student evaluates his own work by comparing his finished job with other completed jobs he is given an opportunity to become aware of his probable deficiencies. One of the outcomes of this procedure is student participation in the formation of judgments. The practice of having the student evaluate his own work is generally accepted.

c) Foreman's Mark on Job. The foreman's mark on the quality of workmanship provides a check balance on the student's own evaluation. It is recommended that the foreman and student agree on the mark by cooperative discussion. Provision should be made for the foreman's signature.

d) Foreman's Mark on Cooperation. From the standpoint of the student personnel organization a mark on cooperation is of considerable value when it is given by the foreman of the department. This mark given by the foreman who has had an opportunity to observe such things as courtesy and reliability is of value to the teacher, and should be considered in the teacher's evaluation.

e) The Teacher's Final Evaluation. With this information which represents student's participation in the evaluation, the teacher is aided in translating the evaluation into a final mark. Since all jobs vary in the amount of time required for their completion, provision should be made to compensate for these differences. An adequate arrangement is to assign a standard time in terms of the number of class periods necessary for the average boy to do the job plus the time required for the teacher to present the instruction.

Numerical values may be assigned to the steps in the marking system in use. For example A = 4, B = 3, C = 2, D = 1, and E = 0. Multiplying the standard time by the numerical value of the final mark determines the credit points earned. This might appear as 6×3 or 18 points. The reader is referred to "Evaluating Pupils' Work in Shops," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION MAGAZINE, February, 1935, page 61, for more information concerning the standard time method.

f) Provision should be made for the teacher's signature.

11. *Additional Administrative Devices:* (*a*) *Teacher's O.K.* It is unquestionably desirable that the boy finish and be released from one job before starting another. This can easily be checked by requiring the student to secure the teacher's approval to start a new job. Before this approval is given the teacher checks back to see that the last job is completed. Provision for the teacher's signature may be included on the planning sheet.

b) *Place for Foreman's Signature.* Under a student personnel organization, the work stations in a department are supervised by a foreman. When a student reports to a department the foreman may assign him a work station. His signature acknowledges the student's assignment to the department.

c) *Issuing Materials.* Small squares placed at the end of the lines near the margin of the paper on which the materials needed are listed provides a means for making a record of materials issued. This may be done by punching a hole in the square with a small spring punch, or by checking the square with a colored pencil. These are the outcomes of this procedure:

1) A worth-while saving of materials is effected.
2) Student difficulty is brought to the attention of teacher.
3) Student appreciation of the value of materials is encouraged.

d) *Foreman Inspection.* There are two kinds of inspection that can be performed satisfactorily by a student foreman, quality and layout. Sanding a wood surface is an illustration of the type of inspection that would be considered a quality inspection. The foreman answers the question, "Is this good enough?" A layout inspection includes layouts and measurements made before cutting and shaping is done. When accuracy is of importance, the foreman should check the location of the center of a hole to be bored, *before the operation is performed.*

To indicate the steps to be checked by the foreman they are circled and a line drawn from the circle into the margin. Upon the completion of any step thus circled, the boy requests his foreman to inspect his work. When the foreman is satisfied that the step is correctly performed, he indicates his approval by placing his initials on the line.

Examples of steps to be checked:

..... 7) Sand edges
..... 9) Make the layout from the blueprint
..... 12) Sand between coats

e) *Teacher Inspection.* The use of foreman inspection does not relieve the teacher from checking the work of the student when necessary. It has been found advisable to inspect the work being done at various stages so that the quality of workmanship may be maintained. A woodwork project should meet the approval of the teacher before the finish is applied. The parts of a project in metal should be approved as satisfactory before they are assembled.

To differentiate between the teacher and foreman inspections, the place for the teacher inspection may be indicated as a regular step in the plan of procedure.

This sample will make the explanation clear:

8) Do finish sanding
9) Attach wheels
10) Teacher's O.K. .....
11) Apply stain

The planning sheet described has been used in the Detroit Public Schools for eight years and has been improved through periodic revisions. The acceptance by teachers was the result of the realization that a better job of teaching resulted with its use.

Mechanical Workers in Printing and Allied Trades*

*Fred J. Hartman***

The need for many new workers in the graphic-arts industries sure to follow the war makes it necessary that vocational guidance counselors and teachers of printing have a rather complete compendium of the varied jobs and employment conditions for ready reference. It is hoped that this compilation, from many sources, pertaining to the mechanical workers of printing and the allied industries, will serve toward this end. It is to be understood, of course, that this deals only with standard practice and may therefore be subject to postwar adjustments, especially applying to women workers.

Classification of Mechanical Workers in Printing and Allied Trades

The mechanical or shop workers in the printing and publishing industries can be classified into three general groups:

1. Composing room workers.
2. Pressroom workers.
3. Bindery workers.

The composing room and pressroom employees are for the most part highly skilled, serving apprenticeships from four to six years before reaching the status of journeymen craftsmen.

Bindery workers, being very largely composed of women, are generally semi-skilled. Bookbinding, however, is a highly skilled trade requiring five years of apprenticeship. The division of labor in the bindery is much more general than in other branches of the printing trades.

Source of Workers and Training Facilities

The workers in the allied trades — stereotyping, electrotyping, photoengraving, rotogravure, and lithography — have acquired specialized skills and must serve the fixed apprenticeship periods set by the respective unions as in the case of the composing room and pressroom employees.

For the past two decades, a large proportion of the workers in the printing trades have been recruited from schools of printing. These schools are scattered rather generally over the entire United States and particularly in the printing centers, and are a part of the public school system, although there are some that are privately operated.

Two main types of courses of instruction are offered: (1) industrial-arts courses in junior high schools, and academic senior high schools, which while not intended primarily as trade training, do serve for prevocational purposes; and (2) vocational courses on a high school level, which are definitely preapprenticeship training for the industry.

In the vocational courses, the student gets an all-round training for the industry, in hand and machine composition and in other occupations of the composing room; pressroom training in platen and cylinder presswork; and fundamental training in the bindery operations. This fits him for one or the other of the many occupations of the industry, apprenticeship for which begins when on the job, sometimes getting credit in the apprenticeship period for his school training.

It follows that the type of employee recruited for the industry is above the average for the trades in educational background. The intellectual level for apprenticeship to the skilled trades, accordingly, is about two years of high school, with the trend toward high school graduates.

Apprentices in the composing rooms in

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**Educational Director, National Graphic Arts Education Association, Washington, D. C.

union shops are required to take a complete graded correspondence course in composing room operations while working on the job. There are also progressive courses of instruction for union apprentices in the pressroom, usually directed from the Technical Trade School, operated by the International Printing Pressmen and Assistant's Union.

Other training of workers to better fit them for their jobs is afforded by part-time and evening courses in schools of printing, and to a rather limited degree, organized training in the plant.

The workers in the allied trades, fewer in number as compared with printing and publishing, are trained for the most part on the job. In recent years courses in offset printing (lithography) are being offered in an increasing number of the higher vocational schools in printing.

Printing is predominantly a *man's* industry. Comparatively few women workers are employed except in the bindery. Women are also employed as linotype and monotype operators, and a considerable number of them feed platen or job presses. Under the wartime pressure, some of the schools have opened their courses to women students to prepare them for possible jobs in the industry. For a number of years, a New England school has been graduating young women in the industry, trained primarily in printing design and layout.

Composing Room Occupations

The composing room is that part of a printing establishment in which type is set, proved, imposed, locked up, and made ready for the printing press. The key employee is the compositor, who by training and experience, has knowledge of all the operations peculiar to the composing room. Depending upon the size of the establishment and the number of workers employed, the compositor may be required to combine most or at least several of the occupations listed. It is only in the larger plants where division of labor is possible, requiring all the types of occupations which are found in the composing room, that the compositor is a specialist in one operation. These occupations and their functions and relative skills are:

1. *Layout man or designer* visualizes the particular job to be done, makes a rough sketch, showing the arrangement of type faces and sizes, and illustrations, selects the paper and ink, and the method of printing and binding, and the use of color. He is required to know the mechanics of printing, the various printing processes, and be somewhat of an artist.

2. *Hand compositor* sets the manuscript or copy in type by hand. This requires a good knowledge of English, of the mathematics of printing, and considerable manual dexterity. All schools of printing offer courses in hand composition.

3. *Linotype (or Intertype) Operator* is one who sets type on a machine forming a solid line of type or slug, by operating a keyboard containing some ninety type characters. It is a job that requires manual dexterity, speed, and a fundamental training in hand composition. Specialized courses of instruction are offered usually in private schools, covering six weeks to two months of intensive training. In a regular course of instruction for compositors, and in apprentice training, it is usually given in the last year of the course. In plants where men operators master the mechanism of the machine, or make adjustments, and repairs, women have proved to be capable of keyboard operation.

4. *Monotype Keyboard Operator* must possess something of the same skill and training as the linotype operator, the keyboard in this case having some 200 keys of type characters. The monotype differs from the linotype in that it casts individual types, operating on considerably different principle from the linotype, perforating a ribbon of paper when striking the keys.

5. *Monotype caster operator* removes the perforated roll of paper to a monotype caster, where the type is cast, and automatically arranged in lines. This is not a particularly skilled occupation, except in such plants where the employee must know the mechanism of the caster so as to adjust and make repairs when necessary.

6. *Ludlow operator* is one who has the same basic skill and training as the hand compositor, since the Ludlow Typograph casts slugs from hand-set and hand-distributed matrices.

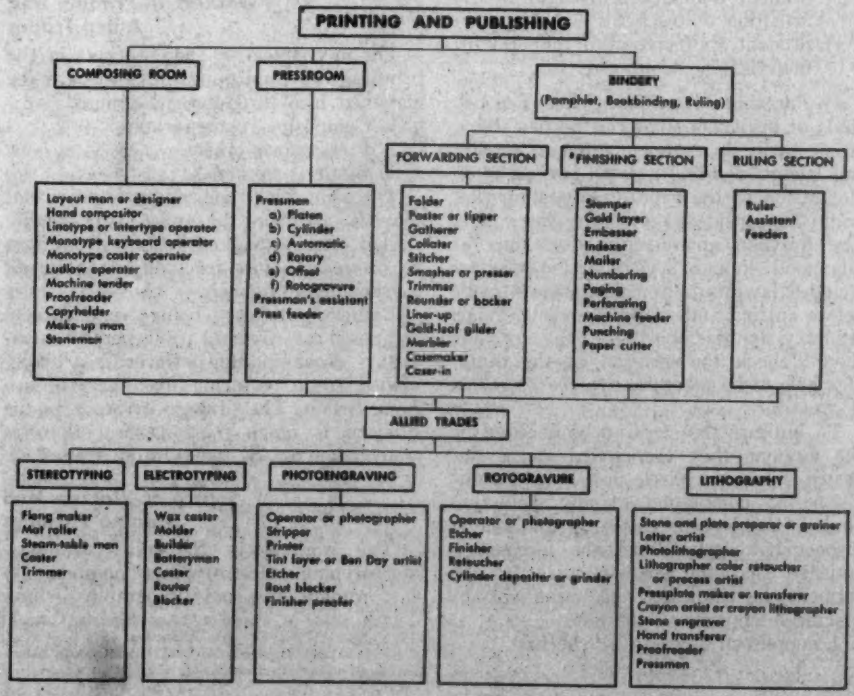
7. *Machinist* is one who possesses specialized training in the mechanism of the typesetting machines so that he can make necessary repairs and adjustments. He finds employment in the larger printing plants.

8. *Proofreader* must possess natural intelligence, a good knowledge of the English language and the aptitude for detecting typographical errors in the printed copy, and the ability to make the necessary corrections in a manner understandable to the compositor. Familiarity with typesetting is the best prerequisite for success in proofreading. It is an occupation open to both men and women. In a five-year apprentice course for compositors, proofreading is usually given in the fourth year of the course.

9. *Copyholder* is the proofreader's assistant. He "holds the copy" and helps the proofreader by watching the copy while the proofreader reads aloud, or in most printing offices, reads aloud to the proofreader. Many proofreaders began their careers in copyholding. Women are employed in many plants as copyholders.

10. *Make-up man* divides the type matter into pages, inserts the cuts or illustrations, puts in the headings, page numbers, footnotes, and ties up the pages. Making up usually includes all operations needed, after type has been composed and corrected on the galley until it is ready to be placed on the imposing stone and be locked up in the chase. It is a position that requires a general knowledge of composition and shop experience.

11. *Stone man* is chiefly employed in the final operation in the composing room — the preparation of the type forms to go to the pressroom. He places the pages of type matter and illustrations on a large, smooth surface, either stone or metal, called the imposing stone, levels the type, and locks the completed form. This occupation requires skill, a general knowledge of the compositor's trade, and physical strength.



The Pressroom

The pressroom is that part of the printing establishment where the presses are operated. Depending upon the size of the plant, there may be one or more presses, and presses of the various types, all demanding specialized skills. In the larger union plants, the man-power problem from the standpoint of complement of men must be taken into consideration. The quota of employees permitted to a fixed number of the presses is a matter for collective bargaining agreement and differs in various localities.

There are three types of employees in the pressroom — the pressman, the pressman's assistant, and the press feeder.

1. *The pressman* is a very skilled workman, trained over a period of years. His work includes operations necessary for printing, embossing, scoring, bronzing (when done on a press), and all kinds of labor which pertain to the press after it is erected and in running order. Presswork includes also the caring for rollers, ink, and paper, as well as the handling of the press and forms. The work calls for skill in proportion to the class of printing done and the kinds of presses operated. The types of presses, each of which requires special training, may be divided up as follows: platen, flat-bed cylinder, automatics, rotary, offset, and rotogravure. In vocational schools of printing, fundamental training is given in platen and cylinder presswork. Most of the training, however, is given in the plant, or in union operated schools, notably at the Technical Trade School operated by the International Printing Pressmen and Assistants' Union.

Besides mechanical skill, the pressman must have a certain artistic skill in the blending of colors and inks. Moreover, physical strength, good eyesight, and good hearing are essential.

2. *The Pressman's assistant* must in general, have the same qualifications as the pressman. He is required to carry out the orders of the pressman.

3. *The press feeder* supplies the printing press with paper, a sheet at a time. This part of the work was formerly considered boy's or girl's work, but the increasing size and complexity of modern presses call for more skill and endurance, and men are usually required to do this work. Modern presses now have automatic mechanical apparatus for feeding the press, but feeders are still employed to keep the press supplied with paper and keep careful check on paper being fed automatically. His duties thus are simpler than those of the pressman's assistant. Women are employed in some plants and make capable press feeders on smaller job presses.

The Bindery

The bindery in a printing establishment is a place where the printed sheets, signatures, or magazines are collected to be bound. There are three kinds of binderies, according to the nature of the work — pamphlet binding (classified as soft), bookbinding (known as hard), and paper ruling. Pamplet binding and elementary bookbinding are taught in schools of printing. Bookbinding is a skilled trade requiring five years of apprenticeship.

The modern bindery has a wide range of occupations, from folding by hand to the actual making of covers and the backing of the book. To perform the hand operations and to operate the varied kinds of bindery equipment, the following are the principal workers who handle the printed sheet as it comes from the pressroom through the various bindery operations:

Forwarding Section of Bindery

1. *The folder* creases the printed sheet by hand or operates a folding machine. This is considered a woman's job, requiring nimbleness of fingers and dexterity to count, insert, and fold at great speed. Men sometimes operate the folding machines.

2. *The paster or tipper* inserts illustrations, maps, or diagrams either by hand or by machine. This job calls for experience in all classes of pasting, and includes what is known in the trade as bolt cutting, tissuing, stubbing, guarding, canceling, inserting, insetting, and tipping. Women are largely employed in this work.

3. *The gatherer* collects folded sheets or signatures into proper sequence to make the complete book. The work is usually performed by young women or girls who pass up and down beside a long table to collect the sheets. In some binderies a revolving table enables the gatherer to work while seated or standing still. Where gathering machines are used, men are sometimes employed as gatherers.

4. *Collator* is one who examines the folded sheets of a book to see that the signatures are in order, or that none is missing. This necessary operation in a bindery is slow and tedious work and requires patience and alertness. Collating is done by women.

5. *Stitcher* is one who fastens together printed sheets with thread, twine, or wire by hand or by machine. A stitcher, generally a woman, but sometimes a man, must be acquainted with different styles of stitching, such as the double stitch, the machine stitch, the saddleback stitch, the side stitch, and wire stitch.

6. *Smasher or presser* presses together folded signatures so that the folds lie flat and are rendered more compact for binding. He uses a flat-headed hammer or mallet or operates a smashing machine. This occupation requires little skill.

7. *Trimmer* operates a power-driven cutter which squares up or cuts the signatures so that the pages can be turned.

8. *Rounder and backer* uses a hammer or operates a machine to round the back of the book and at the same time make the front edges take the concave form. Unless the operator is an all-round binder, this job is really unskilled mechanical work.

9. *Liner-up* glues the cloth headband (a piece of cloth — silk or cotton — used to give ornamental finish to the top and bottom of a bound book) on the backs of some books, and for all books he glues to the back of the pages a cloth to which later the covers are attached.

10. *Gold-leaf gilder* is one who presses gold leaf on the edges of some books, after preparing the edges for this purpose. This operation is usually piecework and requires one who is fully experienced in all processes and materials.

11. *Marbler* is one who is experienced in the art of marbling, a process of decorating leather, end sheets, and edges of books with variegated colors in irregular patterns. This requires experience in the art of marbling, including vat composition, colors, brushes, and sizings.

12. *Case-maker* is one who makes the stiff covers for books, either by machine or by hand. In edition work, the covers (or cases) are made separately and afterwards fastened on the books, in distinction from the method of making the covers of the books on the books themselves. The case-maker is usually responsible for the production of a team consisting of several men, and perhaps one woman, each doing a small part of the process.

13. *Caser-in* is one who sets the book into cover after pasting off (or with glued or pasted back for tight back work) and manages the production on one or more machines, or if done by hand, manages the production of a hand-casing-in team.

Finishing Section of Bindery

14. *Stamper* operates a machine by hand or power to press or print the title and cover design into the cover of the book. He must be able to set up any job, care for press and ink equipment, mix inks, determine heats and pressures, etc.

15. *Gold layer,* frequently a woman, is one who is experienced in handling, cutting, and laying flat or roll genuine gold, on the cover of a book. The gold layer is usually required to perform other hand operations in the stamping department.

16. *The embosser* is one who operates an embossing press for impressing book cover designs. He must be familiar with the embossing process.

17. *Indexer* is the operator of a machine for cutting indentations on the side of the pages on which are placed letters or titles making it easy for the reader to find the place in such books as dictionaries or reference books.

18. *Mailer* wraps the finished book and prepares it for shipping. This is usually done by a woman. In newspaper and periodical publishing plants the mailer's job consists of addressing, tagging, stamping, labeling, bundling or wrapping, cutting lists or preparing wrappers, operating stencil machines, sorting, routing, dissecting or marking wrappers, taking bundles of papers from conveyors or escalators, stacking, folding, handling of bundles or mail sacks, distributing, counting of papers (leaving or returning), typing, sacking, delivering papers (mailers, carriers, agents or newsboys) inserting or dispatch-

ing of papers, envelopes, or magazines. Men are used for this heavier work.

19. *Numbering, paging, punching, perforating, machine feeders, and paper cutters.* These are some of the necessary but minor occupations in a bindery.

Ruling Section of Bindery

20. *The ruler* is one who operates a machine for ruling large blank paper sheets intended for account books, statements, billheads, etc. This is considered a skilled occupation. In addition to skilled operators, there are assistants, and ruling machine feeders.

Allied Trades
Stereotyping

Stereotyping is a branch of the printing trade, usually connected with the larger printing establishments, for the making of metal printing plates, duplicating type forms or illustrations. In printing newspapers where large numbers are required to be printed, it is customary to make a stereotype of the type page or form and print from this stereotype plate. This is a metal printing plate cast from a matrix in a mold, while melted stereotype metal is poured in. The matrix is made by making an impression of the type page, form, engraving, etc., on specially prepared, thick paper. The special paper, called a flong, is made by pasting together several sheets of strong tissue paper and thick, blotterlike, paper with a prepared paste. This sheet, while in a soft pulp state, is laid on the form, covered with a felt blanket, and the whole put into a strong press, heated by steam or hot air, and allowed to set and dry. Stereotypes are now chiefly used by daily newspapers because of the speed with which they can be made and the comparative cheapness of the process. In the more modern plants they are now cast automatically in a machine known as an autoplate.

Speed and exactness are two of the most essential requirements of a stereotyper. There are five principal types of employees, each known by the particular type of work he does: flong-maker, the mat roller, the steam table man, the caster, and the trimmer.

1. *The flong-maker* prepares the sheet of soft thick composite paper used for making matrices for stereotyper, either by hand or by machine.

2. *The mat roller* takes the type page or form to be duplicated, places the flong upon it, covers the back with a blanket of felt, presses the flong down upon the type, either by beating it with a brush or by use of a matrix rolling machine — thus making the matrix.

3. *The steam table man* places the matrix on a table heated by steam or electricity where it is dried under pressure.

4. *The caster* places the matrix into a casting box, where it is pressed usually into a curved shape for use on a web-rotary press. (Some stereotypes are flat.) Molten metal is poured into the casting box and on to the face of the matrix.

5. *The trimmer* takes the cast plate, weighing in newspaper establishments as much as sixty pounds, places it in a machine for trimming, planing, and shaving as may be necessary.

Electrotyping

Electrotyping, like stereotyping, is a separate trade for making duplicate printing plates. The process for making an electrotype is as follows: The type is locked in a chase. An impression is made on a sheet of wax the surface of which has been dusted with black lead or graphite. The wax mold is suspended in a copper electroplating bath and the copper deposits itself in minute particles upon the face of the mold. When the copper deposit is thick enough, it is stripped from the mold, and after covering it with melted tinfoil, which acts as a solder, the copper shell is backed with melted metal resembling type metal.

From this it can be seen that the electrotyper should know something of metals and molding wax and must have a practical knowledge of analytical chemistry and of electrical theory. The regulation apprentice period for this skilled trade is five years.

There are at least seven types of workers in an electrotype department, each of which in a large plant should have a general knowledge of the trade as a whole.

1. *The wax caster* who prepares the wax molds.

2. *The molder* who makes an impression of the type page or engraving or combination of both in the wax. The graphite powder is brushed over the wax mold so that the type will not stick, and the wax will conduct electricity.

3. *The builder* who cuts off the surplus wax from the mold and adds wax in blank spaces and finally attaches two pieces of copper to the mold to form the contact for the electric current.

4. *The batteryman* who takes the mold which has been coated with black lead and covers the impression with a thin coating of copper by pouring over it a solution of copper sulphate and sprinkling with iron filings. He suspends it in a tank filled with copper sulphate and turns on the electric current, producing a thin copper shell in the impression which he separates from the wax by pouring boiling water on it.

5. *The caster* who operates the metal furnace, which gives a metal backing to the shell of copper or electrotype.

6. *The finisher* who examines the electrotype carefully and makes any necessary corrections.

7. *The router* who cuts off high places in the metal plate with a routing machine, cuts and trims the metal back to the proper thickness and, if the plate is to be used on a rotary press, curves the electrotype by applying heat and pressure.

8. *The blocker* mounts the electrotype on a block of wood, by hand, or with a nailing machine, making sure that the finished electrotype is type high.

Photoengraving

Photoengraving is the process of making, by means of the chemical action of light upon a film, engraved blocks for printing, such as half tones, mezzographs, and zinc etchings. By means of photoengraving, reproductions can be made of black and white line drawings, photographs, pencil and charcoal drawings, water color, or oil paintings.

Photoengraving is a highly skilled trade and can use men of different abilities — men with artistic ability, men with manual dexterity, and men with mechanical ability. There are at least eight different divisions of the work, and depending upon the size of the department, a photoengraver may work at one or all of the operations. In a department large enough for the division of labor, the various types of workers are:

1. *The operator or photographer* photographs the picture to be reproduced through a screen made of plate glass on which there are extremely fine lines varying from 55 to 400 to the inch, interposed between the copy and a sensitive plate in a camera. The lines are photographed with the picture and divide it into a mass of minute squares or dots, which later when reproduced on the metal plate and etched, provide a printing surface. In reproducing a painting in colors he places colored screens or filters before or in the lens so that the various colors are sifted out. He develops the negative.

2. *The stripper* moves and turns the film containing the photographic image from the wet plate. Because the image is backward on the negative it must be reversed before printing. This is done by pouring over the film a solution to strengthen it. Then another solution, "stripping collodion," is added to loosen the film from the plate. He strips the film off, reverses it, and places it on a new piece of glass.

3. *The printer* prints the image on metal, either zinc or copper, by preparing a sensitized metal plate, places the glass with the various images on it next to sensitized metal and exposes it to a strong light for several minutes. This brings out the image on the metal.

4. *The tint layer or Ben Day artist* with the use of a special apparatus, termed the Ben Day shading machine, puts shadings and tucks on certain parts of the metal plates.

5. *The etcher,* through the application of coating to the metal plate, known as "dragon's blood," and heat, renders the outline and shadows of the picture resistant to acid. He places the plate in an acid bath, where the unprotected parts are eaten away leaving the image in relief.

6. *The router blocker* cuts away the superfluous surface of the plate, by use of a machine known as a movable-spindle router and mounts the plate on a block of wood, either by hand or machine.

7. *The finisher proofer* clears off the

burrs or bits of metal, repairs broken dots, corrects defects, and brings out the light or dark portions of the plate, and before the photoengraving goes to the pressroom takes a proof of it to see that the finished reproduction is up to standard.

Rotogravure Photoengraving

Rotogravure is a newer development of photoengraving and is much used by newspapers and magazines and also in printing sheets for various classes of commercial work. It is an intaglio printing process (differing from photoengraving, which is a relief process), in which the impression is produced from an etching on a curved plate, or cylinder attached to the cylinder of a rotary press.

The plate is made differently from a photoengraving, but the same type of workers prepare the copperplated cylinder, namely the photographer, the etcher, and the finisher. In addition there is the *retoucher*, who combines type to be printed with the design and makes other changes to bring out the high lights and shadows; and the *cylinder depositor or grinder*, who grinds off the cylinder after it has been used, replates it, ready to be used again.

Lithography

Lithography is a process of printing from a flat stone or a metal plate. The design is placed on the stone or metal plate by hand drawing and by photography. If by photography, the process is known as photolithography.

Another process of lithographic printing is known as offset printing. The subject of the design is often first made on a stone and then transferred to a zinc or aluminum plate, which is curved to fit the cylinder of the press. The imprint is made from the printing plate onto a rubber blanket from which the wet impression is offset on the paper web or sheet.

The workers in lithographic printing require something of the same qualifications as for photoengraving: artistic ability, mechanical skill, including manual dexterity and a knowledge of chemistry. The offset pressmen and the photolithographer must have a strong color sense. The workers are classified as:

1. *Stone and plate preparer or grainer* who rubs pumice over the stone by hand or by operating a machine which agitates the metal plate, covered with steel balls, pumice, sand, and water, to produce a surface on the stone or metal so that it will hold water or ink.
2. *The letter artist* who draws on the picture to be reproduced and any lettering that may be required.
3. *Photolithographer* who puts the design on the lithographic stone by photography rather than by hand or mechanically.
4. *Lithographic color artist retoucher or process artist*, who brings out the details of the picture, or paints them out as may be necessary.
5. *The press plate maker or transferrer* who develops the press plate so that when ink rollers come in contact with the plate on the press, the ink will adhere only to the image and not the clean surface of the plate.
6. *The crayon artist or crayon lithographer* who does color work copies the poster or illustration directly on the stone and metal plate with a kind of greasy crayon which attracts or holds the ink.
7. *The stone engraver* outlines the design to be reproduced on a piece of celluloid or tracing paper, with a steel needle, fills the tracing with colored chalk and places it face down upon a prepared stone, thus leaving an outline of the design. He cuts the design in the face of the stone.
8. *The hand transferrer* inks up the stone engraving, pulls the required number of impressions from the engraving in a hand transfer press and, after a number of operations, makes the plate ready for the press.
9. *The proofer* pulls the proof on a flatbed offset hand press. Due to the general use of color in lithography he must furnish samples of each colored plate as well as a colored reproduction of the combined plates.
10. *The pressman* prints from the lithographic plates on special types of presses for which special skills are required.

Industrial Arts and Citizenship

*Raymond J. Coltharp**

The modern industrial-arts laboratory makes certain definite contributions to the democratic way of living because of the experiences and contacts with a large number of materials common to our industrial civilization. The offering of varied experiences in the laboratory is a decided contrast to the traditional unit industrial-arts shop, where, especially in the smaller schools, the activities consisted of woodworking, and occasionally mechanical drawing. Any subject, course, or activity which will contribute to the sum total of the worth-while experiences of the individual, which broadens his perspective, and teaches him the necessity and dignity of true work well done, as do the experiences in the industrial-arts laboratory, is worthy of consideration.

The industrial-arts laboratory is really a place for scientific analysis, or experiment. Every progressive teacher recognizes and utilizes the power of suggestion, and might well do so when speaking of the classroom for industrial arts, where the main objective is to develop the individual student for more efficient participation in life. Repair and production work, unless so controlled as to provide desirable learning situations, has long been the bane of the industrial-arts teacher, because of the lack of interest on the part of the pupil. Such a criticism cannot logically be made of the experiences in an industrial-arts laboratory, where some pupils may be working with wood, others with metal, others with electricity, others with leather, others with ceramics, and still others with sketching or drawing. The scientific method of approaching a problem, attacking it, and then weighing, evaluating, and applying the solution, is an essential part of our present mode of life, and may well be used in all possible educational situations.

The industrial-arts laboratory, because of the variety of its experiences, is often a deciding factor in helping the student to choose his life's work. This choice of occupation varies from one community to another, and a survey of any community shows definite occupational trends which are significant to the educator. A survey of the male graduates at the high school at Burns, Kans., some years ago, showed that over a period of five years, approximately 46 per cent of the students engaged in agricultural pursuits, 14 per cent went into some form of automotive work, 14 per cent took up work in the oil fields, 12 per cent continued their education, and the remainder took up employment in miscellaneous types of activities. An analysis of the activities met with in these various jobs, shows that the worker most frequently must be acquainted with electricity, auto mechanics, metals, concrete, woodwork, mechanical drawing, sketching, planning, and blueprint reading. Obviously the activities to be included in a course in industrial arts will be those which contribute to occupational knowledge, fitness, and adaptability. Hence, the activities in the Burns High School industrial-arts laboratory are based upon the above named areas, yet the activities are explorational rather than vocational in nature. Especially in the junior high school is the work definitely prevocational, and only during the last years in senior high school does it become vocational, and then chiefly through related information dealing with guidance. No effort is made to develop skilled craftsmen, but a variety of knowledge and interests are sought.

Some of the specific advantages of such a program are:

*Burns, Kans.

1. A better understanding and appreciation of the problems of industry.

2. The development of consumer appreciation attitudes.

3. A more definite knowledge of personal aptitudes and interests.

4. The development of desirable social characteristics through participation in the personnel organization necessary in a functioning industrial-arts laboratory.

5. A realization of the need and value of social harmony and cooperation, developed by group activities, projects, and studies.

6. An appreciation of the need for careful planning, designing, and use of materials to insure socially acceptable results.

7. The development of interests which may later unfold into hobbies and leisure time pursuits.

8. Contacts with a number of materials and processes common to our civilization.

9. The development of the scientific method of research and evaluation of results.

10. The development of safety concepts.

11. The development of open-mindedness.

12. Better home membership, due to an increased knowledge of the materials, uses, and care of equipment found in modern homes.

13. The development of the tendency to critically evaluate, and use the products of industry.

The industrial-arts laboratory recognizes the needs of, and contributes to the culture necessary for efficient social adjustment in our democratic way of life. The dominating industrial tendencies of our day are thus used, controlled, and enlarged upon; hence, we find industrial arts to be a curriculum area which can and does contribute much to citizenship.

Eye Troubles of Machinists

*Dr. Waldemar Schweisheimer**

There is no doubt that good illumination is of primary importance to the individual machinist as well as to the efficiency of a plant. The advantages of good illumination to industry are, according to the Illuminating Engineering Society: (1) greater accuracy of workmanship, resulting in the improved quality of the product with less spoilage and less rework; (2) increased production and decreased costs; (3) better utilization of floor space; (4) greater ease of seeing especially among older employees, thus making them more efficient; (5) less eyestrain among employees; (6) improved morale among the employees resulting in decreased labor turnover; (7) more easily maintained cleanliness and neatness in the whole plant; and (8) greater safety.

Headaches and Glasses

Not only the eyes are suffering from poor vision and continuous strain on the eyes. A machinist suffered for many months from headache in the late afternoon which bothered him considerably and reduced his efficiency. He made all sorts of troubles responsible for the unpleasant headaches: a previous sinus trouble, insufficient sleep, fatigue and exhaustion. Finally an eye doctor found out that he was nearsighted. He ordered the correct glasses for the machinist — and the headaches ceased immediately. Nearsightedness may produce headache as well as dizziness, nausea, and feeling of pressure in the head.

Well-fitted glasses make all troubles originating from nearsightedness, disappear. A nearsighted worker whose glasses are too weak is working with the upper part of his body bent forward. He looks through the rims of his glasses in order to see clearly. The degree of nearsightedness and other optic troubles is determined by the strength of the lenses needed to correct it. The lenses scatter or gather the rays of light which fall upon the eyes so that the correct spot on the retina is reached and a sharp image is projected upon it. The degree of concavity or convexity to which the lenses are ground is expressed in diopters.

*New Rochelle, N. Y.

Old Sight

Usually between the ages 40 to 50 presbyopia (old sight) begins to appear. It is actually a normal change due chiefly to loss of elasticity of the lens of the eye. A machinist of some 42 or 45 years who has always had a good eyesight may note that he must push his work (or his head) further and further away for exact vision. Much can be done to give relief and assistance to aging eyes. Different glasses may be needed for working at close range or reading, and for seeing in distance. In such cases either two pairs of glasses are used; or the worker uses glasses the upper part of which is ground for distance while the lower part is ground for objects at close range.

If the condition be uncorrected, the presbyopic may suffer from pain, fatigue, lacrymation (shedding tears), dimness of vision, headache. Many of these highly skilled older workers can continue to perform efficiently if they have the proper glasses or if the simple means of assisting the eyes with good illumination is adopted.

Workers with old sight prefer especially strong illumination instinctively because this produces contraction of the pupils, and this improves the vision temporarily. But proper illumination is of highest value for every working man.

Illumination in Machine Shops

The Illuminating Engineering Society has recommended certain minimum standards of illumination for industrial interiors. The figures of their table refer to the general lighting or lighting throughout the total area involved as measured on a horizontal plane 30 inches above the floor. The recommended figures in this expert table for Machine Shops are:

	Foot-Candles
Rough bench and machine work	20
Medium bench and machine work, ordinary automatic machines, rough grinding, medium buffing and polishing	30
Fine bench and machine work, fine automatic machines, medium grinding, fine buffing and polishing	50 to 100
Extra fine bench and machine work, grinding — fine work	above 100

The latter two figures mean that a combination of general illumination and supplementary lighting at the point of work is necessary. The design and installation of combined illumination must not only provide a sufficient amount of light but also must provide the proper direction of light diffusion and eye protection. This means that as far as possible direct and reflected glare as well as objectionable shadows must be eliminated. A general rule for illumination is that, where safety goggles are worn, the light reaching the eyes is likely to be materially reduced. The general level of lighting should, therefore, be increased accordingly in the work rooms.

Proper lighting helps greatly to avoid eyestrain, and that is important to prevent additional eye troubles. Improper lighting shortens the duration of normal seeing. The same holds true for flickering light. In very bright light, tinted or dark glasses are desirable. Sunlight and artificial light glaring into the eyes or reflected from such surfaces as glossy paper and tabletops and walls are harmful. Glare interferes with clear vision, and tends to injure the eye.

Other Eye Troubles

Farsighted eyes cannot see the objects near at hand without giving considerable extra work to the muscles of accommodation in the eye. This often results in eyestrain, but the condition can be corrected with glasses. The same is true for correc-

tion of astigmatism — which is produced by an abnormal rotation of the axis of the eye to the side. Vision in such cases is blurred at close range as well as at distance. Other complaints of the astigmatic worker are headache and eyestrain.

There are some methods of treatment which try to exercise the eye muscles and strengthen the eyes in this way. Whatever the success or supposed success of those methods, there is no doubt that any person with nearsightedness, astigmatism, old sight and similar troubles has to wear glasses if he wants to do his work in the most efficient way. But the proper care can prevent unnecessary strain on the eyes and prevent unpleasant eye troubles successfully.

Injuries of the Eye

Should a pointed foreign body be embedded in the eyeball (cornea) or lid, e.g., a splinter of wood or metal or a pointed piece of coal, it may be harmful to attempt to remove it. The attempt may drive the foreign particle deeper into the tissues. Just hold a sterile compress or a clean handkerchief over the closed eye and have the foreign body removed by the doctor. No wound should be touched with the fingers and neither should that part of the compress which is supposed to touch the wound.

Burns of the eyes are quite common. They are caused by boiling water, steam, lime, powder, acids, and the like. Those burns are frequently more serious than splinter injuries. The conmunctival sac must be washed free of the irritating material, and that immediately. That is the reason why you cannot wait for the doctor's arrival in such cases. Great quantities of water should be used immediately to wash out all chemicals, lime, cement, acids, caustic soda from the eye. Irrigation with milk may also be helpful. If a layman has to administer first aid, he must have clean hands and act with gentleness and caution. Then get the patient to the doctor.

A Remedial Industrial-Arts Program for High School

*Harold Fearn**

"The school shop for the retarded is a logical, if troublesome, answer to a problem found in every type of community. Teaching handwork to exceptional children, especially those unfortunate ones whose intelligence falls below the normal, is one of the hardest, and yet one of the most interesting fields of work that a teacher of industrial arts can be called upon to enter.

"Fundamentally, the handwork for this type of pupil is the motivating interest of his school life. Practically all psychologists who have worked with the dull child are in agreement as to the value of shopwork in the training of such children. This is not surprising, because the child's only hope for occupational satisfaction depends upon his learning rudimentary skills and proper attitudes toward work. Furthermore, it is a normal desire of boys of this age group to make things — and these boys are at least normal in this respect. They are limited through their deficiency of mental endowment to jobs of a respective nature, and, at the most, to those of a semiskilled classification. Too often, however, the handwork taught has been merely woodwork supplemented by basketry, rug weaving, or some kindred institution-like type of work. The supposition seems frequently to have been that because a boy of 12 might have the mental age of a child of eight, he would enjoy doing the same kind of work that a child of eight might be interested in doing. While this might be true of an occasional child, it is a grossly mistaken idea for a group. The work must, of course, be graded to their abilities, but it also must appeal to them as worth doing. The fostering and developing of desirable habit patterns toward work can only be brought about if the boys have an interest in and a respect for the type of work they are required to do. Forcing them to do work which does not fill these requirements only results in antagonism toward the school and, to some extent, toward work as such."[1] In carrying out the foregoing, we could suggest that the more difficult projects be given to the more brilliant students, and a simple project to those students whose aptitude is rather limited and also handicapped with a low I.Q.

*High School, Elgin, Ill.

How to Help the Dull Student

"Understanding goes before a decision of value. One must understand the mental characteristics of the dull student, how he thinks, why he thinks as he does, and why he is classified as dull, before good judgment can be used in helping him. We need no expert advice to tell us that there are differences in the thinking qualities and abilities of students. Classifying accurately the really dull and bored or disinterested may require some assistance and is certain to call for close observation.

"The dull student is an individualist."[2] This is not a social attitude but he must be dealt with individually as a means to an end rather than an end itself. "His dullness detracts from his adaptability. He is too slow in his perception to see the need of adaptation to a new situation or to see the needs of that situation. He blunders along in what his slower facilities tell him is the right way.

"Let us look at the characteristics needed to do good mechanical work of the origination type. What are the qualities common to the reliable and good mechanic? The ability to think out or plan the work, measure or lay out with accuracy, cut and shape to the measured mark, and finally to correct any small errors that are made by even the best, constitute a rather skeletal outline. A keen mind for logical reasoning, an assembling in the mental storehouse of facts and reasons in a rapid reference way, practical originality, ingenuity, diligence, willingness to assume responsibility, observance of fine detail, the ability to reason from cause to effect and from effect to cause are further requirements. The greater the capacity for logical thinking, the better will be the mechanic. Such requirements preclude the acceptance of the dull student as a possibility for trade training, at least that sort of training that looks toward the master mechanic as its culmination. That the dull student can be taught to do some so-called trade work is true. Frequent repetitions of the same operations, if monetary award is a goal and the emulative characteristics are catered to, will induce him to hold what might be said to be a maximum amount of attention for sufficient time to acquire some skill. Industry uses these people, not as skilled workmen in trade work, but for machine operators. Such repetition as is required of a production machine is also required as an adjunct to the machine from its operator. The really intelligent person becomes bored to distraction if not affected nervously with such a monotonous grind: The dullard is happy and enjoys this sort of thing, as he thinks little and gets paid for moving.

"To go back to the question 'Should the dull student be "dumped" on the shop?' it would seem that the answer would be 'No.' But to say no without qualifying the answer is dangerous. Certainly the dull student does not belong

[1] LaVoy, Kenneth, "Shopwork for the Special Class," Industrial Arts and Vocational Education, Vol. 25, No. 2, February, 1936, p. 53.

[2] Hoopes, Paul, "What to Do With the Dull Child," Industrial Arts and Vocational Education, Vol. 25, No. 1, January, 1936, pp. 8–9.

in the real trade school. In the shops teaching industrial-arts work in the broadest sense of the name, not as a trade, but as an academic subject, devoting its time to a versatility of training approached from a pupil-interest point, the dullard belongs just as much as he belongs in the academic classroom. The aims in both places are the same: The medium in one, logical thinking with a textbook as a schedule; in the other logical thinking with the personality of the thinker expressed through his handiwork."[3]

The Industrial-Arts Course

"In the high school, where industrial teachers are in charge and where most boys participate in shop and drawing courses, the best way to attain the approval of immature and handicapped boys, and the easiest way to do the most good, is to have a detailed and well-ordered course, and to insist that boys follow it closely."[4] At this point it may be well to note that the training should be adapted to the pupil and not the pupil to the training. "Now that instruction units are known for the elementary phases of most subjects, it is possible to assign appropriate and attractive projects upon which there may well be insistence for all members of the class,"[4] if the projects are varied so as to meet the varied abilities of the students. "The time is so limited and the fundamentals so important that anything less than rigid prescription can hardly be justified."[4] Let instructors at this point review the "four distinct duties" as pointed out by Homer J. Smith, Prof. of Industrial Education, University of Minnesota, Minneapolis.

"First, industrial teachers must build some attitudes; they must encourage their boys to act in manly ways. Naturally, this is the charge of teachers of all subjects, but none are more fortunate in the situation required than are the industrial teachers. The conditions and environments of their work are specially conducive to results in the realm of attitude. They improve respect for property, both personal and public; they lead to cooperative endeavor; they provide trials in leadership and fellowship alike. These attitudes are often too lightly regarded and too seldom a part of our conscious instruction. Second, industrial teachers must stimulate some appreciations; they must make their boys to feel some things. Just as teachers of literature motivate good reading through tactful selection and definite discussion of standards, so should industrial teachers elicit emotional reactions to the best things in their lines. Tight joints, smooth surfaces, harmonious color effects, and the like, are ends to earn and things to be felt and appreciated. Accuracy, speed, and dexterity may be made to seem high attainments. We must teach respect not only for good product but for the higher types of skill. Third, industrial teachers must impart some informations; they must aid their boys to know some things. Informational content may be roughly classified into three types; information that must be supplied in order that an acceptable product may result and that injury to persons and property may be avoided; information characterized as not absolutely necessary to the work in hand but broadening and cultural effect; the responsibility of imparting guidance information regarding the working fields represented by his subject. Fourth, industrial teachers must develop some skills; they must train their boys to do some things. By the use of tools, machines, materials, and processes, they supervise construction and repair. Whatever the philosophy or the method of their endeavors, there is always the physical product. The tangible outcomes of the project and the job are thought of as ends by the unknowing, but industrial teachers view them rather as means to ends. They furnish opportunity for attainment of physical and mental growths or expansions not susceptible of quickening through other types of study."[5]

These objectives resolve themselves into an orientation program for the high school, in which the student learns the way man lives and earns in an involved technology. Thus, it is seen that by considering the factors of philosophical background, statistical data, adolescent interest, and a thoughtful regard for the established objectives of the industrial arts, we are expanding the high school industrial-arts program to one of paramount importance.

The Instruction Sheet

The attainment of the objectives pointed out in preceding paragraphs depends wholly on the instructor's ability to meet the varied abilities and interests of the class. This may be done by preparing individual instruction sheets. The whole philosophy of the individual instruction sheet, is that it permits each pupil to rely fully on his capacities. One does not need to enlarge upon the fact that supplying a group of students with identical lesson sheets is individual instruction only in form. Some will find a given instruction sheet too easy; some, too difficult. Whatever may be the reason for the lack of fit between the pupil and the instruction sheet, the success or failure of the method rests upon overcoming it. This can be done by individualizing each instruction sheet.

"One practical way of individualizing these sheets, that is, adjusting each to meet the requirements of each and every student, is to set up each lesson sheet on three levels; section A which gives the exact page assignment in various references for the slow student, section B which suggests the index of various references for the average student and section C which leaves the selection of references in the students' hands. Such a scheme involves overcoming various inherent difficulties, among them determining the subject matter suitable to each level, and on the same basis assigning problems, projects and questions. As may well be expected, this adjustment of subject matter and assignment to students of various abilities involves a technique that cannot be easily commanded by inexperienced teachers.

"An instruction sheet so devised possesses a high degree of fitness for each student. Each sheet is so formulated and so set up in both the information and the assignment sections, that the more backward pupils actually have an excellent chance of getting by their own efforts those essentials of the lesson that they may fittingly be termed the 'core.' They therefore experience the thrill that comes from being successful, and come to read a fresh meaning into the process of being educated. Another section of the sheet is prepared especially for the student who has the intelligence, the equipment, and the attitudes that enable him to do work of average grade, both as respects quantity and quality. The final section poses those problems that only the most capable and conscientious students would have the time and the inclination to attempt. The three sections, moreover, rather definitely present the material spirally, so that the more capable and industrious students benefit from both more intensive as well as more extensive study.

"This plan appears to impose upon the instructor the problem of determining which students shall be required to operate at each level. In reality, the students are maneuvered into effecting this sorting-out process themselves. This is done by the simple device of setting a time limit upon each sheet, this time being sufficient to enable the diligent 'slow' student to complete the 'core' or section A of the assignment. Then, their own habitual attitudes toward school work, in combination with those devices that the skilled teacher commonly uses to keep every student keyed up to doing his best, will lead each student to get as much out of the lesson as his capacities permit. This device of a maximum-time limit has another advantage, it keeps the group more or less together so that, should occasion arise, topics of general interest can be presented and discussed to the benefit of every member of the group. Those students who surpass the minimum level for a satisfactory rating get as much credit as the amount of quality of their work considered in the light of their ability, call for. To a considerable degree, since the instructor strives to keep each pupil interested and devoted to his task, the amount of ground covered during the time set for the completion of one of these individualized instruction sheets becomes the determining factor in the rating."[6]

(Continued on page 158)

[3]Hoopes, Paul, "What to Do With the Dull Child," Industrial Arts and Vocational Education, Vol. 25, No. 1, January, 1936, pp. 8–9.

[4]Smith, Homer, "Meeting Student Desires," Industrial Arts and Vocational Education, Vol. 24, No. 4, April, 1935, pp. 105–106.

[5]Smith, Homer, "Four Distinct Duties," Industrial Arts and Vocational Education, Vol. 23, No. 12, December, 1934, p. 369.

[6]Henig, Max, "Individualizing Instruction," Industrial Arts and Vocational Education, Vol. 24, No. 11, November, 1935, pp. 325–326.

Industrial Arts and Vocational Education

John J. Metz, Editor

A FINE PIECE OF WORK WELL DONE

Doing something for dear old alma mater is an ideal readily sold to any high school graduating class. Probably the project described in the January, 1945, issue of *The Journal of the National Education Association,* entitled "Day of Service," might suggest a project which would pay dividends in several ways, especially in these days of manpower shortage.

The article referred to describes how two hundred boys and girls of a high school graduating class met on Saturday, June 10, 1944, to put in a day of work, painting, repairing, scrubbing, and grading the playground. It was a new type of graduation class present.

The project, first of all, demanded a great deal of planning. The survey committee, consisting of students, had been appointed some time in advance. They had done their work conscientiously and had outlined some 24 jobs which had to be taken care of.

To help in this survey, the buildings and grounds were divided into nine areas, and a survey committee was appointed for each of these sections. It was the duty of these committees to list the needs of their respective areas.

When these survey reports were in, the principal met with a board of directors that had been elected by the students and set up an enlistment sheet. Each of these sheets contained a detailed description of a job, gave the name of the teacher-foreman, and presented space for the signatures of volunteers. Within a day 165 of the students had signed up.

The PTA, knowing their sons and daughters, prepared to give them a picnic lunch under the trees. Besides this, canteen service was on hand throughout the day.

As already mentioned, the project paid dividends in several ways. The boys and girls, who worked so diligently all day, learned from firsthand experience what it means to keep a public building in working order. The boys who replaced the 800 bolts that had been taken out of the auditorium seats have a better idea now why bolts are put into such furniture, and why they should not be removed just to see what would happen. Those who helped to scrub and paint the walls of the lavatories that had been disfigured with vulgar sketches and writings began to get a glimmer of the bad taste displayed by those who practice such inanity. Those who repaired windows that had evidently been broken deliberately, no doubt determined that vandalism of this kind was senseless and costly. Then, it is hoped, that those who gouged away the accumulation of years of gum wads from chairs, benches, and tables, resolved not to resort to such unsanitary methods of parting with their gum.

No doubt, every student who helped learned a valuable lesson on the value of cooperation, and experienced the fine feeling which accompanies the willing performance of a good deed.

The parents also learned valuable lessons and after that fine piece of house cleaning the school, the teachers, and the community were much closer together.

Similar planning might be started in many schools the country over. The time to do the preliminary work is right now. The principal of Alice Deal Junior High School, Miss Bertie Backus, succeeded in accomplishing this fine piece of civic work with her boys and girls — can you do likewise?

Another bit of work of a similar nature was performed by the high school students at Centertown, Mo. Here the motive was to devote one day to wartime activities. Sixty-eight students participated. The boys picked 74 bushels of milkweed down and collected 480 pounds of wastepaper; the girls made 24 toys for the Junior Red Cross, and 23 dozen cookies for the local canteen.

These suggestions furnish an excellent method of overcoming some of the youthful delinquency about which one reads so much.

PRESERVING SIGHT

Statistics which show that one out of every five children that are graduated from the elementary school in the United States has some type of visual defects are highly disquieting. News of this kind should prompt every parent and every teacher to see whether or not something can be done to help these youngsters acquire and preserve that precious gift of good eyesight.

Unfortunately, few people pay much attention to the question of adequate light for reading or doing various kinds of work when natural light is not available. Many, too, are not careful to make use of natural light in such a way, that it is not harmful to the eye.

Education especially should be interested in the advances that are being made in providing proper lighting for the children who attend school, and who use their eyes so much while they are in the classroom.

Then there is the matter of having the eyes of these youngsters checked up at regular intervals so as to take steps to correct conditions that may cause eye troubles, or if possible, apply remedial measures to defects that have already been caused. In the school and at home, the matter of proper reading posture should also be emphasized.

All of this should have special meaning to the shop teacher. In the shop, the provision of proper lighting is very necessary because accuracy must be emphasized. Frequently the rearrangement of benches and equipment will help to improve the light for working conditions. In many of our school shops improper fixtures cause glare. In many others, the light at the working-surface level is entirely inadequate. These conditions need correction, and the changes to be made should not depend on haphazard guessing. It is best to entrust the job to a lighting engineer, and to follow his directions as closely as possible.

The problem of good vision for the students is of utmost importance, and since it affects our entire youth for better or for worse, it requires our most serious attention.

IMPORTANCE OF SAFETY

Data gathered by the National Safety Council shows that the time lost in one year due to disabling injuries of workers — on and off the job — was equivalent to a shutdown of the nation's entire shipbuilding and aircraft industries for 38 days.

Information such as this, by its very enormity, ought to impress every teacher with the need for greater emphasis on the teaching of safety. This impression will be further strengthened by the information that 2,300,000 of our workers were injured off the job in that same year.

The record becomes still more alarming when it informs us that the accidental deaths during that year of World War II had its greatest increase in the 0-14 year group. That puts the duty of inculcating safety instruction directly up to the family and the school. Can we do something about this?

(Continued from page 156)

How to Write the Instruction Sheet

"A criticism frequently leveled at the individual instruction sheet is that many students are quite incapable of grasping the material the sheets present. A little study would undoubtedly lead the critic to realize that it is either only the relatively few unwilling or inadequately prepared students who cannot profitably use these sheets, or that the sheets have not been satisfactorily adapted to the abilities of the pupils for whom they are intended. The diction of these sheets must be such that the average pupil can grasp the facts presented with a minimum of effort. To this end, the writer of such sheets must attend always to the aptness of his wording and particularly to its comprehensibility.

"These sheets all possess inherent difficulties, due to the very fact that they are instruction sheets, and that they present material, generally of a technical nature, which in itself presents learning difficulties. Whatever can be done to facilitate the learning process should be done, whether it be simplifying the sentence structure of the sheet or relying almost entirely upon a vocabulary that is familiar to the average student.

"Attaining this standard of a lesson sheet so written that its diction is scientifically adapted to the students for whom it is intended, is well within the experienced teacher's abilities. Thorndike, as a result of his extensive studies on the vocabulary load of books, advocates the inclusion of only one new word to every two hundred of reading matter."[7] "The question is whether this standard applies to the particular case of the individual instruction sheet. Individual instruction sheets so written that they present at most one familiar word to every two hundred of reading matter, except in the case of a review lesson or where a technical terminology is required, will undoubtedly go far toward solving the learning difficulties that many students experience when faced with this method of instruction."[8]

Testing

This program would not be complete without pointing out factors which underlie the development of informal objective tests to be used with individual instruction sheets. "Ideal teaching results may well be considered to have been obtained when the student not only remembers the subject matter of the various assignments which he has covered, but also evidences that he has understood and organized the material so that he can apply it properly when the occasion arises. Systematic testing is the only practicable device that measures the extent to which these teaching products have been achieved. This applies whether the instruction has been given by the individual lesson-sheet method or by the procedure used in the traditional classroom.

"The formulation of individual test sheets presents a whole series of problems. The easiest section to set up is that planned to test the student's knowledge of the subject. One needs to guard against unduly simplifying the test. The questions, if possible, should not be identical with those that appeared on the assignment sheets. If this cannot be avoided, they should at least be put into new combinations to compel the student to make a corresponding rearrangement of his stock of ideas. So administered, testing is also teaching. Test questions to induce the discovery of relationships are excellent to prove that he not only remembers the material but actually understands its significance. Of still greater significance pedagogically is the test question based, say, on some news item that gives the student the opportunity actually to apply the information he has acquired in school to his own problems or those of his community. Test questions like these reveal to the pupil that the school can contribute helpfully in the everyday affairs of his world, and give him the chance to arrive at a sound attitude toward them. Test sheets so formulated play a definite part in the teaching process.

"The ideal test sheet, one that would examine the student's ability to remember subject matter, to apprehend it, and to apply it to his extramural interests and activities would consume in every instance an inordinate amount of his time. This obstacle can be avoided in either of two ways: by making the section of the test devoted to the determination of the student's ability to recall subject matter, a sampling of the material; or by formulating this content-testing section of the sheet as an informal objective test. The first advantage of the informal objective test is its definiteness. By this device, every important element in the content of any series of lessons can be tested in an amazingly short time and with comparatively little drain upon the student's energies.

"It is advisable to remark in closing, that whereas the taking of an informal objective test imposes only a slight strain, the same does not hold true of formulating them. On the other hand, the ease of rating this type of test in itself compensates entirely for the labor of evolving it."[9]

Note of acknowledgments:

The foregoing article is merely a combination and condensation of other articles previously published in this magazine, and is presented here because the author hopes that it will be as helpful to others as it has been to him.

[7] E. L. Thorndike, "Teachers College Record," Vol. 36, Oct.–Dec., 1934, pp. 123–144.

[8] Henig, Max, "The Vocabulary Load of the Individual Instruction Sheet," Industrial Arts and Vocational Education, Vol. 25, No. 10, October, 1936, pp. 300–301.

[9] Henig, Max, "Developing Individual Tests," Industrial Arts and Vocational Education, Vol. 24, No. 5, May, 1935, p. 137.

The Co-ordinator in Vocational Distributive Education

*Murray Banks**

The teacher-co-ordinator is the key factor in developing youth into acceptable beginning store workers and salespeople. This chapter will discuss the importance of the teacher-co-ordinator's personality, the duties of the co-ordinator, the various activities carried on by the co-ordinator with the pupils and with the cooperative stores.

Importance of the Teacher-Co-ordinator's Personality

If a cooperative program for retail selling is to succeed, it is essential that the teacher-co-ordinator be one who can command the respect and admiration of store executives or owners, school authorities, and students.

The merchant respects the judgment and suggestions of the teacher who is well informed about the retail business in general and about the community in particular. From the standpoint of the merchants, therefore, the ideal teacher is one who is thoroughly versed in store organization and procedure; knows merchandise, both textiles and nontextiles; is familiar with the local retail stores and their merchandise, service, and personnel problems; and is acquainted with local store executives.[1]

Kenneth B. Haas says that:[2]

The school executive, in selecting a teacher of retail selling should endeavor to find one whose personality will be pleasing to the other members of the school; whose scholastic record is equal to or better than that of the majority of the faculty members; and who can also teach other subjects, such as English, mathematics, science, or a language. He should understand young people of high school age and should know how to counsel with them. Students in cooperative part-time

* Associate Professor of Marketing, Long Island University, Brooklyn, N. Y.

[1] Adapted from Kenneth B. Haas, *Distributive Education* (New York: Gregg Publishing Co., 1941).

[2] *Ibid.*, p. 121.

retail selling classes frequently need unsuspected aptitudes, abilities and attitudes in dealing with problems that confront them in their work in the store.

Unless the retail selling teacher understands youth, he cannot be what he should be to his students — a combination of friend, counselor and guide. He should exemplify that which he expects of his students in personal appearance, in attitude towards store work, in knowledge of the duties of the various co-operative store positions for which students are employed, and in the ability to perform these duties competently.

It is essential that the retail selling teacher believes sincerely in store work as a vocation, and that he be imbued with a desire to be of service to the students who wish to receive training for such work, and to the stores that are interested in obtaining trained employees. It is important, also, that he be thoroughly familiar with retail store organization, and procedures and with the duties of the various positions which his students will hold and for which he will assist in training them. He should be able to recognize store problems and to grasp the point of view of store managers or owners; and he should be equally familiar with the problems with which the school executive is confronted in carrying on the training program in the field of retail selling. Since the retail selling teacher is frequently called upon to act as the co-ordinator of a training program, he should be so familiar with the problems of both the store and the school that he will be able to act with unbiased judgment on any controversial problem involving these two agencies.

It will be impossible for a teacher to maintain an unbiased attitude in dealing with the problems involved in conducting a program of training for retail store work unless he has had considerable experience in the retail store field.

The store owner or manager will counsel wholeheartedly only with the schoolman who has proved his ability to earn a respectable living in retail store work.

In discussing the abilities which it is necessary for the teacher-co-ordinator to possess in conducting all the essential teaching activities efficiently, this same writers lists the following abilities as the most important:[8]

1. Ability to direct the growth of high school youth in acquiring maximum social and selling abilities.
2. Ability to stimulate and direct pupils in analyzing their social and selling experiences in the store so that they may know how to learn from these experiences.
3. Ability to develop and maintain an efficient school and store cooperative part-time training program for beginning store workers and salespeople.

These abilities are possessed only by teachers who have a high social intelligence and who have had enough selling experience to be able to do successfully any one of or all the kinds of store or selling work for which they are training students. Teachers of retail selling cannot teach what they do not know. Moreover, regardless of the natural social abilities a teacher may have, he cannot attain maximum teaching success unless he has had adequate training in the teaching of retail selling, including the management of part-time co-operative training programs.

The teaching techniques involved in developing social and selling abilities in students are so different from those involved in teaching commercial or college preparatory subjects that special training in the use of these techniques is essential. Teachers of other commercial subjects who have had no selling experience and who do not know from experience what is required from salespeople and store workers cannot render efficient service in teaching retail selling.

The ability to render satisfactory service in a retail store cannot be acquired through a theoretical knowledge of abstract principles learned from a book and reproduced in a recitation. On the contrary, it can be acquired only by active participation in the social situation that confronts store workers and salespeople in their daily work. The teacher of retail selling is a teacher of behavior rather than of words, general principles, or abstractions.

Duties of the Co-ordinator

Perhaps more important than any other matter in successful cooperative undertakings is the work of the co-ordinator. It is the co-ordinator, as the term implies, who is finally responsible for what a course in cooperative education accomplishes.

The duties of the co-ordinator may be briefly outlined as follows:

1. To collect and organize the teaching material for the courses in retail selling.
2. Bring to the school criticisms which are made in connection with the performance of the pupils in the stores.
3. Interest businessmen in the program, make arrangements for the employment of students, select the boys and girls and send them out (this includes looking after working permits, keeping records, etc.), and after the young people are placed, interviewing them in school and obtaining reports, both formal and informal, on their work. Out of these reports grow material for classroom work and subjects for personal interviews.

The inherent nature of this type of vocational education makes the supervision, co-ordination or follow-up activities the key to successful functioning of the training. When the co-ordinator carries on the supervisory or co-ordinating activities in addition to offering the related instruction in the classroom it is possible to secure a close co-ordination of the experiences in the store and instruction in the school; the responsibility for the two phases of training is unified; the teacher is thus better able to adapt his instruction both in content and method to the problems confronting the student and his employer.

In the operation of the Millville program the co-ordinator visited each student on the job at least once each week and conferred as often as was necessary with the store official under whose supervision the student came. He thus kept in close contact with store procedure and was in this manner best able to make school training supplement store experience.

He advised the student regarding the problems that arose out of the new relations in the store and thus paved the way for full-time entrance into business.

Activities With the Cooperating Stores

The activities which the co-ordinator carried on with the cooperating stores included the development of contacts with store managers, visiting store executives to discuss progress of students, and keeping executives interested in the cooperative plan, especially by getting their suggestions for improvements, and by awakening their responsibilities for training young employees.

Adjusting trainees, particularly to necessary social contacts with fellow employees, was a frequent activity. It was the responsibility of the co-ordinator to get store executives in some stores to transfer student workers to a new job whenever the student was found to be proficient in his present duties.

One of the most important activities of the co-ordinator in his relationship with cooperating stores was the building and maintaining of personal contacts between the school representatives and the store officials necessary for the success of the cooperative plan, for these personal contacts are the basis of the good will that is mutually necessary.

Activities With the Pupils

The activity which was most frequently carried on by the co-ordinator was that of giving the students constructive criticisms of their work in the stores. From the very nature of the work of the co-ordinator this is quite naturally the activity most frequently engaged in by the co-ordinator with the pupils.

Other activities were observing the work of the students, conferring with students on placement, guidance, adjustment, and follow-up.

As the co-ordinator is responsible for all details connected with the cooperative plan, many of the activities have to be given to keeping contacts with student workers, directing their reactions to their work, making adjustments of many kinds, stimulating working efforts, and the like.

Following Up Employed Students

"Follow-up" consists of observing the students at work or interviewing the store supervisor about the student, or both.

The co-ordinator visited the students at the store when the students were actually at work, and attempted to talk with the store supervisors at the time they were least busy. The students were followed up by the co-ordinator within three or four days after they had been placed in a cooperative part-time position, and their work was checked thereafter as frequently as the co-ordinator's observation or the store supervisor's reports indicated a necessity for such visits.

It is only by following up the student in his work on the job that the teacher becomes familiar with the student's abilities, his limitations with respect to store work, his home conditions, and his school social contacts.

The teacher-co-ordinator should, therefore, keep a close check upon the work of his cooperative part-time students employed in local stores. He should observe them at work and should check his obser-

[8] *Ibid.*, p. 130.

vations with the store supervisor with a view to providing related classroom instruction that will assist the student to meet more effectively the daily problems arising in his work.

The teacher is in a position to talk frankly with the student about his store work, about any home or school situation that may be interfering with the successful performance of his store duties, or about his aptitude for store work when he has this information at his command.

The student can thus be made to realize that his work in the store is an integral part of the retail selling program; that he has a responsibility to the school as well as to the store in connection with this training program; and that the teacher is personally interested in him as an individual and in his progress in store work.

It goes without saying that the teacher-co-ordinator should at all times use good judgment in his observation and follow-up work. He need not encroach upon the store supervisor's time by consulting him during each store visit. The informal, verbal reports of the store supervisors are likely to be more meaningful than the written reports.

No store training program is complete that does not provide for careful guidance and follow-up of the student throughout his working experience as a member of a cooperative part-time training class.

Other Activities Carried on by the Co-ordinator

The promoting of cooperative education for retail selling within the school, among the stores, among the students, and among the parents is a frequently performed and a highly important activity of the co-ordinator.

The co-ordinator must necessarily gain familiarity with accepted business practices, build confidence of merchants in the value of the cooperative training program, get favorable publicity from newspapers, address organizations interested in sales training and vocational education, such as the local Chamber of Commerce, merchants' associations, and service groups.

The co-ordinator must organize his activities so that he is successful in getting proper school recognition of the course, especially for the time spent in cooperative work, and in conferring with parents, especially for adjustment problems involved.

Maintaining Standards

If an effective training program is to be maintained, and if improvement is to be assured, it is important for the supervisor or co-ordinator to periodically evaluate his program and to compare it with other operating programs in terms of desirable practices.

The writer has made extensive use of the following evaluation sheet, and has found it to be extremely helpful and worth while. It provides standards and desirable goals for cooperative part-time programs.

Standards for Cooperative Part-Time Programs' Evaluation Sheet

I. *Legal Requirements.* Are the following observed?

A. All students are 16 years of age or over.

B. Students are employed a minimum of 15 hours per week for 30 weeks.

C. Program is under public supervision.

D. The instruction is of less than college level.

E. All members of classes are employed in distributive occupations.

F. The students are regularly enrolled in school.

G. Teachers meet requirements set up in state plan.

II. *Physical Facilities.* Do they meet the following qualifications?

A. Classroom
1. Desirable location.
2. At least 60 square feet outside ventilation provided.
3. Sixteen square feet room space per puil.
4. Proper lighting and heating.

B. Furniture and fixtures provided.
1. At least 6 square feet working space at table for student.
2. Ten-foot merchandise counter for selling and wrapping.
3. Adequate blackboard space.
4. Typewriter, table, chair, bulletin board.
5. Wall shelving and standard file cabinet for merchandise and display.
6. An equipped office room for private conference.
7. Teacher's desk and chair.
8. Files for ready reference materials, such as books, magazines, bulletins, pamphlets.
9. Adequate filing space for student's records.
10. Adequate storage space for supplies.

C. Supplies available
1. Duplicating machine (or have access to such a machine).
2. Wrapping material (roll of wrapping paper and ball of twine).
3. Stationery, stamps, and postal cards.
4. Mimeograph paper, stencils, and carbon paper.
5. Clips, bands, paper punch, stapler, etc.
6. Salesbooks and a set of business forms.
7. Manila folders.
8. Dummy or real merchandise.

D. Library accessible
1. At least 15 reference books (for related work).
2. One different reference book for each type work represented in the program in any current year.
3. Access to one related trade journal for each occupation in the program.
4. One dollar per student per year for related material.
5. A supply of pamphlets, bulletins relating to each occupation in the program in the current year.

III. *Instruction.* Is it in spirit, intent and application, satisfactory in the following items?

A. Course content
1. Must be supplemental to daily work of pupil.
2. Must be practical.
3. Must provide for civic and vocational intelligence.
4. Instruction must make student feel that his job is important.
5. Interest in work must be stimulated.
6. Must be based on individual schedules of processes.

B. Methods of teaching
1. Leader discussion.
2. Individual.
3. Group.
4. Visual aids (or have access to such aids).

C. Classroom management
1. Systematic routine followed in preliminary matters.
2. Self-motivated plan for related study.
3. Definite system for getting work activities of day started.
4. Teacher-student understanding.

IV. *Co-ordination Activities* — Have the following standards been met satisfactorily?

A. Publicity
1. Can show clippings from local newspaper.
2. Has talked to at least one local civic organization (public service clubs, chamber of commerce, etc., during the year).

Has presented at least one assembly program or one display during the past year.

B. Selection of students
1. Must meet grade and attendance requirements set up by the local school authorities.
2. Must meet requirements of store.
3. Must be able to profit by the instruction.

C. Selection of training agencies
1. Reputable firm
2. Not confined to seasonal goods.
3. Conforms to legal requirements.
4. Cooperative employer.
5. Does not exploit labor.
6. Honest and fair in dealing with employees and customers.

D. Records
1. Attendance
a) Distributive education classes
b) Job
2. Job activities
a) Daily work sheets
b) Weekly work sheets
c) Time schedule
3. Personal
a) Previous school work and confidential information
b) Home visits (conditions found)
c) Rating reports
1) School faculty
2) Employer
d) Reports of conferences
1) Faculty members
2) Trainers
e) Application for admittance signed by parent
f) Work permit
g) Copy of social security number
h) Previous employment (type work done and rate of pay)
4. Placement and follow-up (accurate and up to date)
a) Places of employment
b) Length of employment
c) Changes of employment
d) Wages paid from time of employment
e) Type work on each job

V. *Professional Atmosphere:* Does the co-ordinator show high professional qualities as evidenced by the following items?

A. Member of professional organizations
   1. State Education Association
   2. State Vocational Association
   3. American Vocational Association

B. Cooperation
   1. Attends all state and district distributive education meetings
   2. Attends all state and district D. O. meetings
   3. Cooperates with other co-ordinators in a state-wide improvement program
   4. Takes care of state correspondence promptly
   5. Has state reports in on time
   6. Is loyal to local and state administration
   7. Assumes and discharges duties of regular faculty member

C. Improvement
   1. Attends state or other schools offering distributive education courses, the equivalent of one full summer every three years
   2. Works in a distributive occupation the equivalent of two four-week months every three years
   3. Attends A. V. A. Convention
   4. Attends state commerce convention
   5. Membership or activities in some local civic organization as Chamber of Commerce, civic clubs, community leagues, church, etc.

SUMMARY SHEET

Report on Standards — Cooperative Part-Time Classes

(For detail report, see evaluation sheet)

City..... Co-ordinator.....
School..... Date.....

I. *Legal Requirements*
(Age, hours, public supervision, instruction, employment, enrollment)

II. *Physical Facilities*
(Classroom location, ventilation, space, lighting, heating, furniture and fixtures — table, counter, blackboard, typewriter, bulletin board, shelving, files supply space
Supplies — duplicating machine, materials, folders, merchandise
Library — reference books, trade journals, pamphlets, bulletins)

III. *Instruction*
(Course content — practical, supplemental, interest, individual
Methods — leader discussion, group, individual
Management — routine, motivation, understanding, discipline)

IV. *Co-ordination Activities*
(Publicity — news, civic contact, assemblies
Selection — student, school requirements, store, profit by instruction
Selection training station — reputable, legal, cooperation, regular
Records — pupil, job, visits, reports, conferences
Placement — length, changes, wages, type of work)

V. *Professional Atmosphere*
(Membership in professional organization; cooperation; assumption of duties; improvement in service; convention; membership in organizations)

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Person making report

Summary

This article has discussed the importance of the personality of the teacher-co-ordinator in the successful promotion and maintenance of a cooperative part-time training program.

The chief activity of the co-ordinator while observing the students at work in the stores was to give constructive criticism, while the chief activity as related to the stores was to develop store contacts. The chief outside activities of the co-ordinator were to make speeches and to otherwise promote the work in the community, in the school, and in the stores.

Teaching Materials for Industrial Education

*Chris H. Groneman**

(Continued from page 131 of the March, 1945, issue)

The following list of teaching aids was collated to help the teachers of the various departments of industrial arts and vocational education.

Many of the booklets and articles contained in this list have cost those who distribute them quite an appreciable amount of money. It is but courtesy to enclose sufficient postage with your request to cover mailing charges.

It is advisable that teachers use school stationery when writing for any of the items listed. All items are free unless otherwise noted. In most cases a small charge is made when free items are ordered in quantities.

Woods

Adjustable Clamp Co., 417 N. Ashland Ave., Chicago, Ill.
Clamps — 30-page catalog

American Forest Products Industries, Inc., 1319 Eighteenth St., N.W., Washington 6, D. C.
American Forests
Trees for Tomorrow
New Magic in Wood
Where We Grow Our Trees (28 by 34-in. map)
Products of American Forests (25 by 30-in. chart)
Set of 4 posters depicting logging operations
Questions and Answers About the Forests (available to teachers only)
Wood You Believe It
Supplement Educational Material

American Screw Co., Providence, R. I.
Screw Chart and Bit Sizes for Woodwork (chart)

Appalachian Hardwood Mfrs., Inc., 414 Walnut St., Cincinnati, Ohio
Appalachian Hardwoods — America's Finest
Chestnut as a Core Wood
Appalachian Beech, Birch, and Maple
Appalachian Yellow Poplar

E. C. Atkins and Company, 402 S. Illinois St., Indianapolis, Ind.
Pertinent Pointers in Care of Saws
Pruning
Saw Sense
Wall Chart
Directions for Fitting Narrow Band and Small Circular Saws
Atkins Silver Steel Practice Filing Strips — $1.80 per dozen

Boice-Crane Co., 930 W. Central Ave., Toledo 6, Ohio
General Equipment Catalogs
Drill Press Catalog
Metal Spinning Instruction Book — 10c

Sanford C. Briggs, 200 N. Division Ave., Grand Rapids, Mich.
Furniture — $1 plus postage

California Redwood Association, 405 Montgomery St., San Francisco, Calif.
California Redwood — Its Properties and Uses
Physiology of Trees
Durability

Casein Company of America, Division of Borden Co., 350 Madison Ave., New York, N. Y.
Glued, Laminated Wood Beams, Arches, Roof Trusses
Glued, Prefabricated Houses
Glue Recommendations for U. S. Government Specifications
Wood Glues for Aircraft Manufacture (chart)
Casco Trouble-Shooter for Joint Gluing
Service Bulletins
Bulletins:
No. 103a — Urea-formaldehyde resin glue
No. 104a — Phenol-formaldehyde resin glue

Albert Constantine and Son, Inc., 797 East 135th St., New York 54, N. Y.
Constantine Master Manual for Woodworkers 1944–1945 — 25c
(Each order also includes six issues of Constantine's *Chips and Chats.*)

Craftsman Wood Service Co., 2727 S. Mary St., Chicago 8, Ill.
Hunt's Revised Woodworkers Catalog — 10c

*Industrial Education Department, A. & M. College of Texas, College Station, Tex.

Lumber-Veneer-Plywood-Cabinet Hardware

Delta Manufacturing Co., 600–634 East Vienna Ave., Milwaukee 1, Wis.
How to Plan a School Workshop — 50c
21 Lovely Lamps — 10c
19 Charming Chairs — 15c
One-Evening Projects — 10c
Garden Furniture and Novelties — 10c
40 Fine Tables — 25c
Furniture Designs — 25c
Novelties — 25c
Toys, Games, Playground Equipment — 10c
Small Furniture — 20c
Lathe Book — 25c
Drill Press — 25c
Circular Saw and Jointer — 25c
Shaper — 25c
Bandsaw and Scroll Saw — 25c
Abrasive Tools — 25c
Practical Finishing Methods — 50c
Batch No. 1 of Delta Craftsheets — 25c
Ring Binder for Delta Craftsheets — 50c
Both Batch No. 1 and Ring Binder — 75c
Delta General Catalog

Department of Conservation, 121 State House, Springfield, Ill.
Fire — Forest's Public Enemy No. 1 (chart)
Forestry Laws
Planting Black Walnut in Illinois
Forest Trees of Illinois
Elements of Forestry
Forestry News (issued quarterly)
Forest Tree Planting Manual for Illinois
Illinois Conservation
(Available in limited quantities. Single copies to teachers are free.)

The DeVilbiss Co., Toledo, Ohio
General Catalog (DI)
ABC of Spray Painting Equipment

Henry Disston & Sons, Inc., Tacony, Philadelphia, Pa.
Disston Saw, Tool and File Manual
Disston Pruning Guide
Hacksaw Blades
File Chart
How to Use Saws for Crosscutting and Ripping
Hacksaw Chart

Douglas Fir Plywood Association, Tacoma Bldg., Tacoma, Wash.
Douglas Fir Plywood
Plywood Schools
Prefabricated Small Farm Buildings (chart)
Prefabrication of Hog Structures
Prefabrication of Small Poultry Structures
Minimalic Construction for Minimalic Men
The Square and Its Uses
How to Organize and Supervise Boy Guilders Clubs
Plywood Construction Bulletins
Plywood and Its Uses
Dri-Bilt Manual
Light Stain Finishes for Fir Plywood
Beautiful Interiors
Paneling Suggestions
Painting Exterior Plywood
Suggested Specifications for Douglas Fir Plywood
Industrial Uses for Fir Plywood
Research
Plywood Speeds War Effort
Plywood Goes to Sea for Uncle Sam
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Grade and Size Data (wall chart)
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Foley Manufacturing Co., 30 Second St., N.E., Minneapolis 13, Minn.
Illustrated brochure on *Foley Automatic Saw Filer*

General Finishes Sales and Service Co., Div. of W. H. Pipkorn Co., 1548 W. Bruce St., Milwaukee, Wis.
Facts on Preserving and Finishing of Beautiful Wood

The Hartford Clamp Co., East Hartford, Conn.
General Catalog

Homasote Co., P.O. Box 441, Trenton 3, N. J.
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Uses of Homasote in Conventional Construction
Here, There and Everywhere
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S. C. Johnson & Son, Inc., Racine, Wis.
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Hows and Whys as Applied to Floors, Furniture, and Woodwork
Teacher's Outline — Household Management
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Lussky, White and Coolidge, Inc., 65–71 W. Lake St., Chicago, Ill.
Catalog of Cabinet Hardware

Mahogany Association, Inc., 75 East Wacker Drive, Chicago 1, Ill.
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J. H. Monteath Co., 202 Lewis St., corner 6th St. and East River, New York 9, N. Y.
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National Paint, Varnish and Lacquer Association, Inc., 1500 Rhode Island Ave., N.W., Washington 5, D. C.
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(To be continued)

Industrial-Arts Filing System

*William B. Bradley**

The filing system described in this article is one that has proved to be very helpful to the author in the filing of industrial-arts instructional material. The system has grown out of a need for a quick and easy method of filing, not only instruction sheets, information sheets, lesson plans, designs, and job sheets; but also other miscellaneous data pertaining to the industrial arts. The system is such that it may be used in the shop by students and teacher alike, or it may be used as the teacher's own home file.

The system was organized as an attempt to satisfy the following needs:

1. A file to which students could go and obtain instruction sheets, job sheets, etc., without the aid of the teacher, and also, what is probably more important, a file to which the instructional material could be returned and placed in the proper order without difficulty.

2. A file that would be so arranged that material pertaining to one particular activity could be obtained without leafing through material on other activities.

3. A filing system that would permit the teacher to gain a brief summary of what was contained in a particular article or instruction sheet without having to look it up.

4. A filing system that would permit expansion, one that would permit building up a collection of material on activities, even though these activities were not being taught at the time.

5. A filing system that would keep a record of material on such subjects as clubs, industrial arts, philosophy, guidance, etc.

For the sake of simplicity in describing, the plan is divided into three parts: Part A — Material Filing, Part B — Filing Cabinet Arrangement, Part C — The Card File.

Part A — Material Filing

The first step in the process of organizing was to separate all the material, having to do with actual instruction, into the various activities, as, art metal, ornamental iron, sheet metal, woodworking, foundry, forge, auto mechanics, electricity, radio, plastics, concrete, aeronautics, machine shop, leatherwork, textiles, ceramics, plumbing, printing, mechanical drawing, etc. The other material was separated into such classifications as test material, administration, supervision, guidance, safety, biography, industrial arts, philosophy, shop organization, equipment and supplies, state courses of instruction, industrial arts in other schools, and miscellaneous.

The next step was to obtain several hundred (depending upon the amount of material) triple cut folders, size 9½ by 12 in. These folders may be purchased in lots of one hundred at a reasonable cost. Every project sheet, plan, blueprint, sketch, instruction sheet, information sheet, job sheet, photograph, etc., was then inserted in a separate folder. In the case of several different plans for the same type of project, these were all placed in one folder.

The third step was to carefully label each folder with the name of the project or with the phase of instruction represented. Allowance was made at the left for a small block ¼ by ½ in. and at the right the abbreviation for the activity and the number of the folder. In regard to numbering, some method had to be adopted to prevent duplication or mixing, so it was decided to have numbers from 1 to 100 inclusive, designate material dealing with projects and ideas for projects. Numbers from 101 and upwards designated instruction sheets, information sheets, and related information. In case of information and articles on such subjects as guidance or philosophy the folders were simply numbered from 1 upwards until all the material was covered.

Fig. 1. Examples of folders

The fourth step was to decide upon a color scheme for filling in the ¼ by ½-in. block at the left side of the folder. Only that material that pertained to particular activities was included in the color arrangement. The reason for this was because the colors were meant, for the most part, to be an aid for students and they would not have access to the other material. Each block was filled in with colored India ink — a separate color or combination of colors for each activity. Note: One color was used for both projects and instruction sheets in the same activity.

Examples of colors were as follows: art metal — red; ornamental iron — white; sheet metal — green; electricity — brown; woodworking — black; ceramics — green and white; textiles — red and black, etc. See Figure 1 for examples of the folders as they looked when completed.

Part B — Filing Cabinet Arrangement

The first consideration regarding the arrangement of the filing cabinet had to do with the cabinet itself. Quite suitable cabinets may be constructed in the industrial-arts shop if desired, or cabinets may be obtained through the school, taking advantage of the school discount. The author obtained a four-drawer steel cabinet of standard size, together with a two-drawer steel card file and three thousand 3 by 5-in. file cards. This seems like a considerable number of cards but it is surprising how much material the average industrial-arts teacher has gathered together.

The next step was to label the front of each drawer from top to bottom, as follows: (1) personal data and miscellaneous, (2) projects, (3) instructional material, and (4) related information. In the bottom drawer the author files all his INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazines, together with a number of booklets obtained from manufacturing companies. These booklets are of different sizes and in order to provide a neater arrangement they were all bound into booklets of one size.

The drawers of the cabinet having been labeled the material was then placed in the drawers.

Part C — The Card File

The card file represented the most difficult and correspondingly the most important part of the filing system.

The first step in arranging the card file was to type a card for each folder in the cabinet. A card was also typed for each article in the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazines that particularly appealed to the author. These cards were arranged with the name of the project or topic in the upper left hand corner, below this — the number of the folder or the issue of the magazine. In the upper right hand corner was typed the activity,

*Central School, Randolph, N. Y.

Lamp-Radio — Art Metal — project
A.M. — 28

RADIO LAMP

A good 9th-grade general shop project. Consists of shade, shade support, tray, and bud-type ornament for socket.

Material — 16-oz. copper, copper rod ¼ in., copper rivets, socket, ¼ in. threaded pipe.

Operations — drilling, filing, bending, forming, planishing, cutting, annealing, cleaning, finishing.

Guidance and Industrial Arts — Guidance
Industrial Arts and Vocational Education, 1936, Jan. 7

GUIDANCE AND INDUSTRIAL ARTS — LANDIS

A good article on the part an industrial-arts teacher may take in assisting the guidance program. Includes suggestions for individual and group guidance.

Fig. 2. File cards

grouped together with the word project or instruction sheet, depending upon whichever it happened to be.

The next step in the process was to read over each folder or article and then type a brief description on the card. This involves quite a great deal of work but if the headings have been typed on the cards the file may be used and the descriptions filled in at leisure. However, if the file is to serve its purpose efficiently these descriptions should be carefully composed in order that they may be readily understood at some future time.

Figure 2 shows examples of cards completely filled out and ready for insertion in the card file.

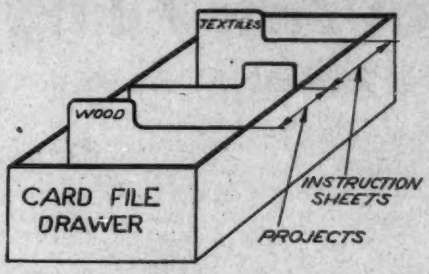


Fig. 3. File drawer showing card dividers

The final step in arranging the card file was to cut separators for the file. These separators were made from discarded folders and were made the same size as the cards except that a portion of the card was extended about ½ in. above the regular card. On this portion was lettered the name of the activity. The extended portion was located on the left side of some of the cards and located on the right of others. Thus one card was labeled with the name of the activity and the file cards immediately following this were those designating projects.

The other card was left blank and had the extended portion at the opposite side. This card designated the beginning of the cards dealing with instruction sheets. See Figure 3.

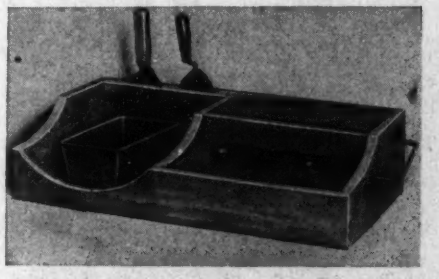
After the card separators were completed and inserted the file cards were all arranged in alphabetical order and with the folders arranged in numerical order the complete filing system was ready for use.

Problems and Projects

KEENE CEMENT TRAY

L. A. RANDALL
Indianapolis, Ind.

The tray pictured is to be used in a shop with the usual equipment for general shopwork where work with Keene cement is offered. A convenient size is 6 by 14 by 26 in. The largest covered space holds the cement while the smaller compartments are for coloring materials. The trowels and pan are used for the mixing.



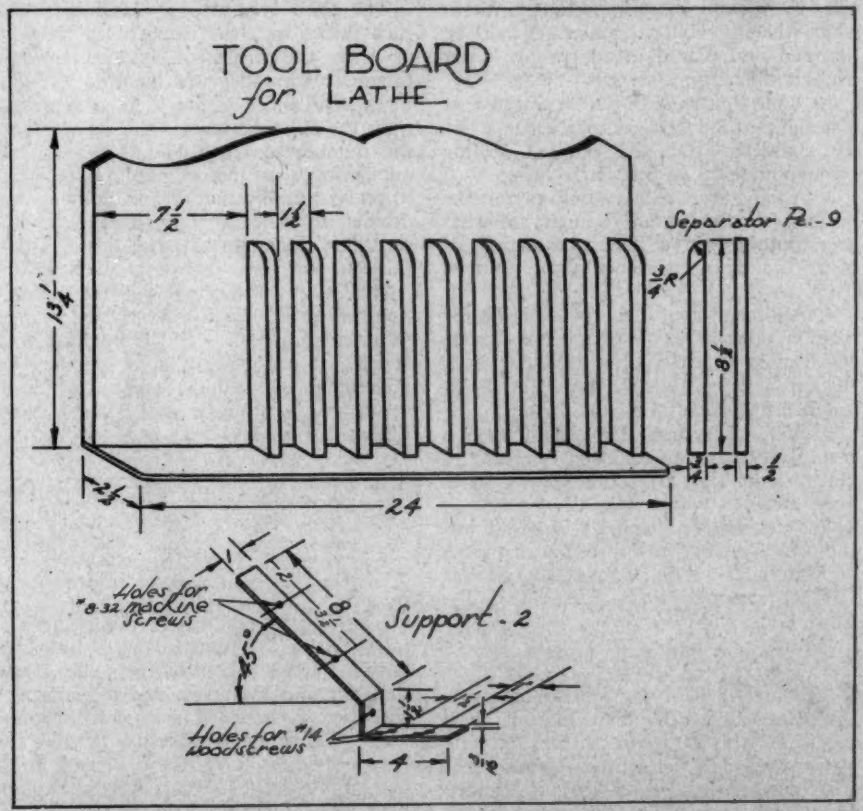
Tray for Keene-cement work

When the work is done on a metal-covered staining bench the matter of cleaning up after the casting is made is simplified.

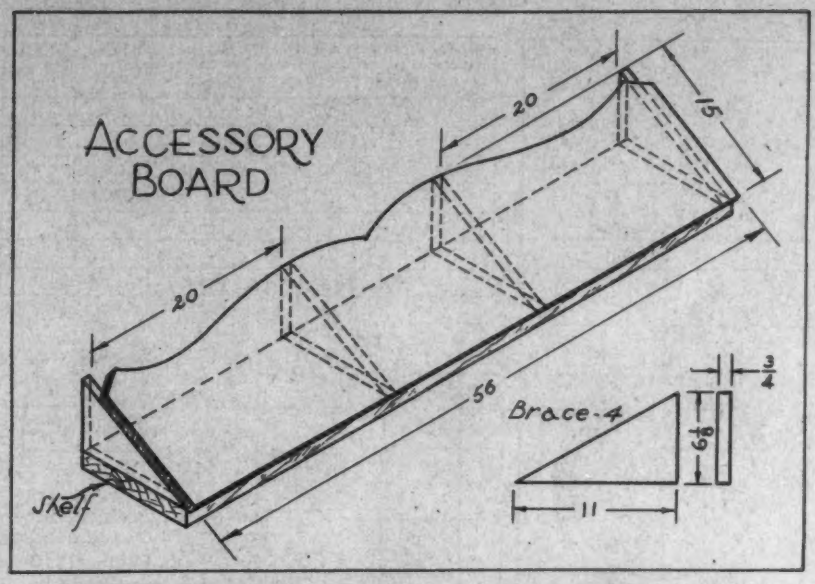
WOOD-TURNING TOOL AND ACCESSORY BOARDS

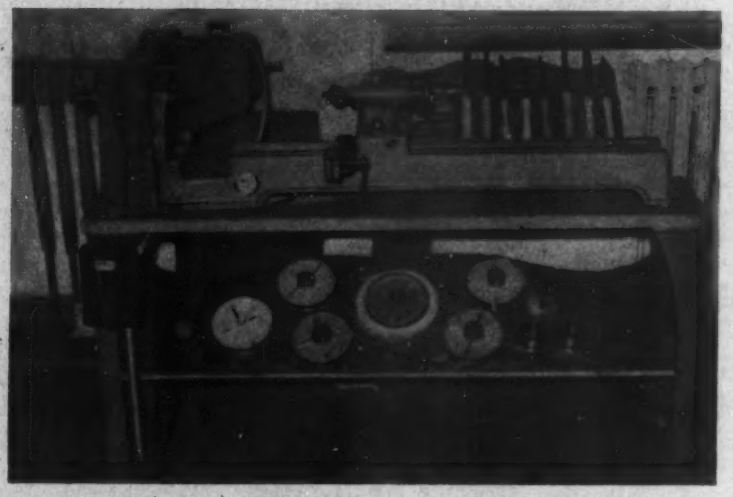
PETER C. FURNARI
Wappingers Central School
Wappingers Falls, N. Y.

The conscientious shop instructor who wants to keep an orderly shop is interested not only in keeping tools and accessories in order, but in keeping them readily accessible and convenient at all times.



Turning tools have usually been mounted back of the lathe and though they are handy there, it is impossible to identify each tool at a glance, and unless all the tools are set on the lathe at one time, a worker loses much time. Frequently it is necessary to remove several tools from the holder before the one tool required is finally obtained. The lathe accessories other than the turning tools, too, have presented the instructor with a good housekeeping problem. Instructors and students waste many hours during the course

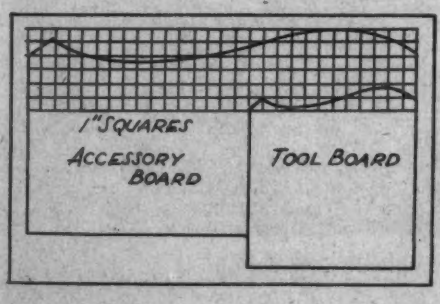




of a term to tidy up the lathe accessories which have been piled up indiscriminately on the lathe shelf or in some near-by bench drawers where they become hidden and are somewhat inaccessible. Though wallboards have partially solved this problem, many shops find them inconvenient and the workman, therefore, wastes many valuable hours.

The lathe tool and accessory boards described herewith are very compact, orderly, readily accessible, and they occupy but a minimum of space.

The construction of the lathe tool and accessory board unit is simple and can be done by any shop student who has had fundamental woodworking. After all the wood pieces are prepared, they are stained and given three coats of shellac. The band iron supports are cut to length, marked, drilled, and countersunk. Next, the supports are bent to shape and screwed to the lathe bench top so that they will set in 3¼ in. from each end of the tool board when it is set on the supports. Then the tool board is set on the supports and drilled from the back through the holes already drilled in the band iron for the machine screws. The tool board is then fastened with machine screws to the supports.



The accessory board may be mounted by several different methods, but mounting it on braces, as shown, will be found quite satisfactory. The braces are first nailed to the shelf after which the accessory board is set in and nailed, or screwed to the braces.

After the accessory board has been fastened, the markers or identification tin-plate blanks are prepared. These blanks, which are outlines of the various lathe accessory pieces, serve two distinct purposes: (1) they mark the location of the lathe accessory pieces; (2) they protect the board. The blanks are traced on tin plate from each accessory piece with a scratch awl. Then they are punched with a solid punch (1/16 in.) to accommodate the escutcheon pins which fasten them to the accessory board. Larger holes to accommodate the square bent screw hooks are also punched. These hooks support the accessories on the board.

Bill of Material

No. Req.	Name	Material	Size
1	Back	5-ply fir plywood	¾ x 13¼ x 24
1	Bottom	3-ply fir plywood	¼ x 2½ x 24
9	Separators	Scrap wood	½ x ¾ x 8½
2	Supports	Band iron	3/16 x 1 x 13½
4	Fasteners	Roundhead machine screws	No. 8-32 x 1 in.
6	Fasteners	Flathead wood screws	No. 14 x 1 in.
1	Accessory board	5-ply fir plywood	¾ x 15 x 56
4	Braces	Scrap wood	¾ x 6½ x 11

SPUR GEAR MODEL

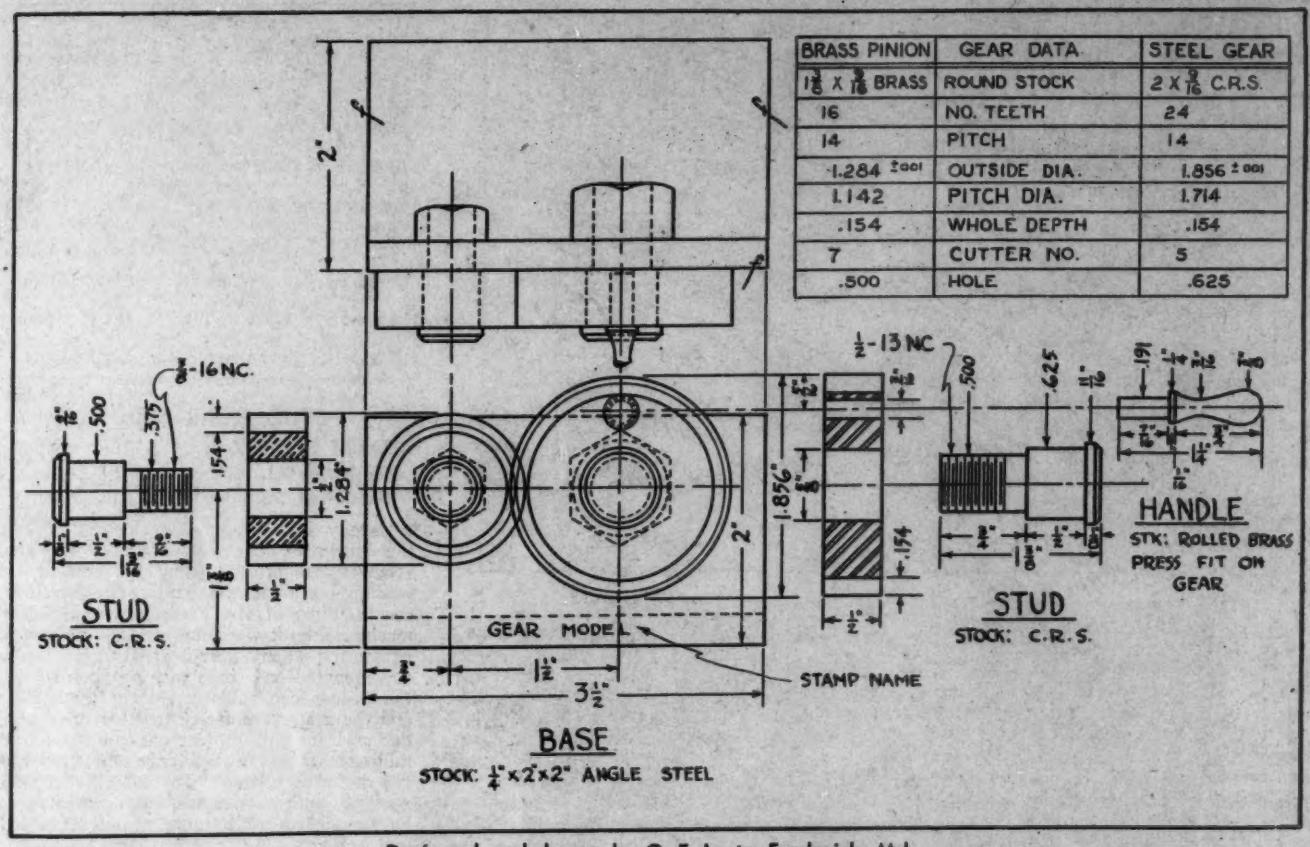
GEORGE F. LARTZ
High School
Frederick, Md.

Usually in a general machine-shop course the cutting of spur gears is one of the final achievements attempted by the student. In working out a spur gear cutting problem to fit the facilities of the Frederick High School machine shop it was found that more interest is manifest when a gear is fitted with a handle and mounted on a base with a pinion so that the trainee can actually see the teeth mesh and the gears turn freely together. The gears designed for this project are cut on a light milling machine on which only simple indexing can be accomplished. However, in a shop equipped with heavier machines the gears may be redesigned for a more complex problem and in addition to the experience acquired in the cutting of teeth in brass and steel, a cast iron gear may be added to the assembly. In working out a job of this sort extreme accuracy is very essential if a smooth operating model is to be obtained, and much care must be given the machining of the blanks and studs, and in the layout of the angle steel base. The model illustrated herewith was made recently by a 17-year-old senior high school boy. The following general steps are used in turning out this job.

Machining and Cutting Gear Blanks

1. In turn, mount the brass and steel stock in the universal chuck
2. Face stock, drill holes 1/64 in. undersize, and ream to size
3. Press blank on mandrel
4. Turn blank to required diameter between centers
5. Determine and drill 3/16-in. hole in steel blank for brass handle

Spur gear model



Designed and drawn by G. F. Lartz, Frederick, Md.

6. Prepare milling machine — mount index head, foot stock, arbor, and proper cutter
7. In turn mount blanks between centers; set feed and speed and depth of cut
8. Cut gear noting indexing carefully
9. Clean off burrs, stamp initials, and polish

Machining Studs

1. Mount short scrap stock in turn in chuck or collet
2. Machine to exact dimensions
3. Set up lathe for threading and cut threads to fit hex nut
4. Cut off, finish turn large end, and polish over all
5. Chuck short end of brass and form handle

Finishing Base

1. Cut length of steel angle from bar
2. Spare stock, draw file, and break corners
3. Lay out and drill stud holes
4. Initial and polish finish surface

Assembly

1. Press brass handle into steel gear
2. Mount gears on studs and oil
3. Mount studs in base and tighten hex nuts
4. Turn in for instructor's inspection

Final Check

1. Do gears mesh and turn snugly yet freely?
2. Is the tooth thickness the same particularly those made on the first and last cuts?
3. Is base square?
4. Are the stampings in line?
5. Is the job highly polished?

THE FUNDAMENTALS IN JUDGING A HOUSE

J. EDGAR RAY
The Stout Institute
Menomonie, Wis.

(Continued from page 73 of the February, 1945, issue)

The next design, Figure 17, is one that can be found in most communities in the U. S. Note the huge dormer window, the heavy verge, board, and the huge unnecessary, but expensive, brackets.

Note the grouping of windows — three cottage windows which almost makes it impossible to have good ventilation from that side of the house. The door is a big sheet of plate glass wrongly used. The wide overhanging roof is a shining example of waste of materials. The use of brick in the porch is questionable. The only thing that can be said about the design as a whole is — "It is a perfect mess."

Figure 18 will give the reader some idea of what could have been done with the same materials and good planning. It is not hard to see in these ten examples what is pleasant and in good taste and what is atrociously in bad taste.

Fig. 17. Another example of poor design

Fig. 18. A pleasing design of an English home

Figure 19 shows one of the many popular designs in bungalows. An attempt has been made to doll up the entrance, but it isn't hard to see that the design doesn't fit this type of house. The windows are symmetrical, but not of good design. The proud owner may think he has something unusual but a skillful designer would detect a number of errors in the design without much trouble. A glance at Figure 20 shows what might have been done had the designer known something of styles, types of windows to use, where to place them, and so forth. The whole appearance of the house in Figure 20 is one of restful repose. The house looks as though it really belonged in its setting. The shape and broad expanse of roof, with the white stucco walls and their casements placed at random flanking the entrance is an interesting mass. A study of this sketch cannot fail to impress the reader when comparing it with Figure 19. Figure 21 shows a bungalow with a glaring display of useless projections — brackets, brick piers, cottage windows, with a roof and a dormer mutilated by the designer's desire to create something out of the ordinary. The house looks nervous and over dressed, and lacks the good taste and design found in unpretentious small houses which show an honest and correct use of materials.

The sketch for Figure 21 was made from a photograph and no doubt one can see similar examples all over the land. The house shows a combination of materials, brick, stone, stucco, glass, et cetera, all of which are practically thrown together with no rhyme or reason.

The projection of the roof is far beyond that which should have been used for good proportion. The exposed rafters, and the barge board on the front of the house, supported by brackets, is unnecessary, if the house had been correctly designed. Summed up briefly — it is a monstrosity in residential architecture.

Figure 22 shows a house costing much less, but which looks far superior to the one just described. The general appearance is comfortable and pleasing. The plain lines of the roof will always be interesting. The porch is worked in nicely and shows definite efforts and results in good planning. The chimney has stability and ruggedness. The simplicity and design of the chimney fit in admirably with the roof and the general appearance.

The porch columns are light, but the placing of them gives one the feeling they are ample for the load they are carrying. The lowness to the grade line gives the house the appearance — "it belongs there." The windows are handled nicely with the grouping well done on the side elevation. The lack of shutters on one elevation does not interfere or mar the elevation showing a large divided window with shutters. Figure 23 illustrates a poorly designed bungalow and its remedy would be a design similar to the Cape Cod house shown in Figure 24.

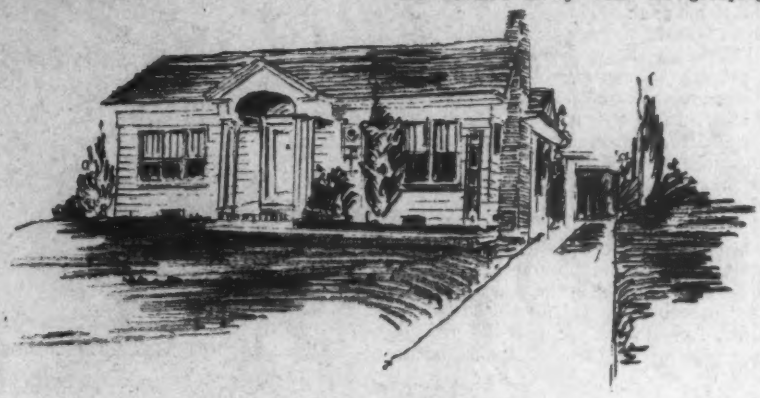


Fig. 19. Poorly designed

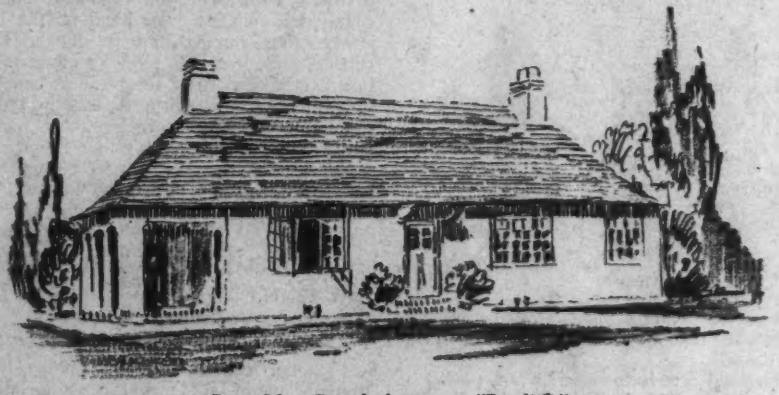


Fig. 20. Good design — "English"

Figure 23 was more or less common several years ago, and has nothing to show that could be called well done. The bay window squeezed in the gable is evidently some carpenter's handiwork in designing. The square battered and stubby columns are typical of this type of one story house built by contractors and builders to sell quickly with no thought of that they are in bad taste, and that they will have little value in a resale within a few years.

The wide overhang of the cornice braced

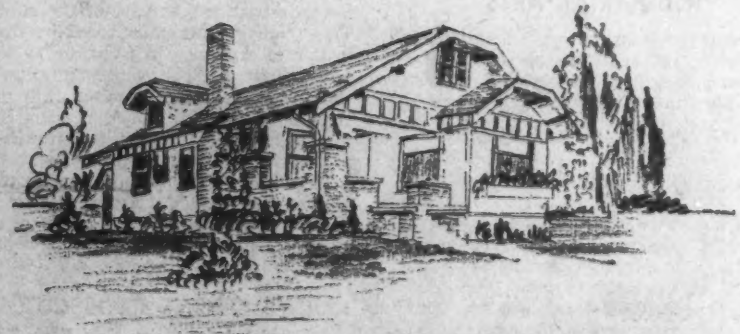


Fig. 21. A poorly designed bungalow

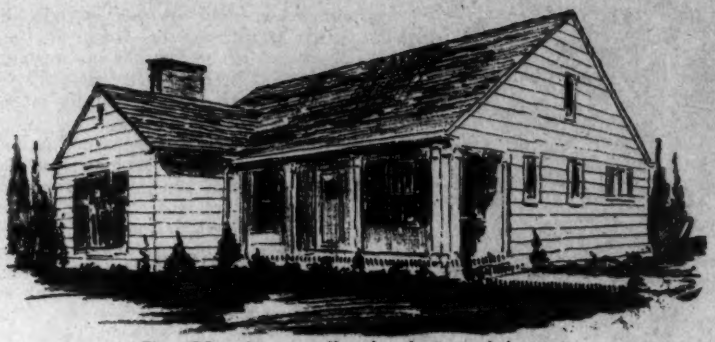


Fig. 22. An excellently designed house

by heavy brackets and the huge verge board are very poor. The different pitches of the roof are not indicative of good designing. The "bricked in" porch is another example of poor use of material.

Figure 24 shows a modest little Cape Cod house illustrating the wise use of materials. It is properly proportioned and has well spaced windows. The entrance which is simplicity itself, fits in well with the design as a unit. The huge chimney is quite a contrast with that in Figure 23, but it fits the design. The addition or annex is well handled, and note the consistency of the roof design and the pitch.

The floor level is very close to the ground which also adds to its appearance. The lack of porches seems to add to the general appearance and probably will not be missed by the occupants. A study of the two designs will convince the reader there is something to

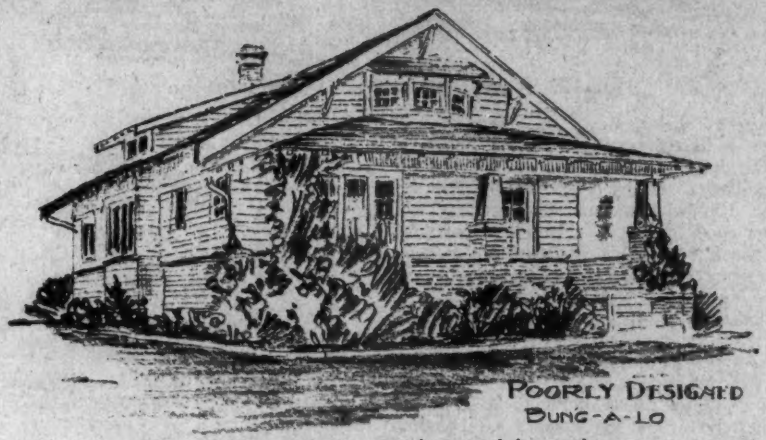


Fig. 23. Another poorly designed bungalow

Fig. 24. A well designed "Cape Cod" home

the proper designing of a home. Of course, the landscaping will add much to the general appearance of any home, and usually requires expert advice on what to plant and where.

INDUSTRIAL ARTS

A recent questionnaire concerning industrial arts which was sent to superintendents of Missouri high schools has revealed interesting facts shown in the following table:

1. Number of questionnaires returned	236
2. School systems offering industrial arts	75
3. Industrial-arts programs dropped, no teacher	26
4. School systems expecting to offer industrial arts	52
5. School systems anticipating an expansion of the existing program	67

Certain trends seem to be indicated by this data.

Industrial arts is to experience a period of rapid growth. This is indicated by the fact that 52 school systems indicated a desire for industrial arts as part of the curriculum. This trend is further indicated by the anticipation of expansion of 67 of the 75 programs now in existence. The 26 programs now closed, because of a lack of teachers, will probably reopen as soon as trained personnel can be obtained, thus adding to the growth of the total programs over its present status.

Assuming the first-mentioned trend is clearly indicated, it would seem a second naturally follows. Any expansion of existing programs or establishment of new programs demands trained teachers.

JOYS OF THE CROSSCUT SAW

(Reprinted from the *New York Times*)

Give a man a pile of logs, a sawbuck the right height, a sharp crosscut saw, and a partner with a sense of rhythm in a strong right arm, and he can enjoy himself and cut a lot of fireplace wood. He can't keep it up all day, maybe, but he can keep at it quite a while if he has periodic pauses to puff his pipe and survey the results of his labor.

There's something in the rhythm of a two-man saw that satisfies the soul on a cool day in early autumn. But that rhythm must be precisely right. Too fast, and there is no time for breathing. Too slow, and the saw hesitates, hangs its teeth, gets nowhere.

And there is a proper touch to each stroke. You pull, and you press down just enough to get a bite, and you relax and ride back with your partner's pull. Or, if the saw is freshly sharpened and the wood not too green, you press down not at all, but let the saw carry its own weight through the log.

Two-man sawing can be a test of friendship as well as cooperation. The slightest twist on one handle at the proper time can freeze your partner's stroke; or you can wear him out simply by weighing your hand on the backstroke, thus forcing him to do the heavy cutting while you ride free. Youngsters learn in no time how tricky the business can be.

But there's a remedy for that. Put two such pranksome youngsters on the saw as partners while you sit back and smoke. When they have pranked themselves into a cooperative mood, take one end of the saw yourself. Then the sawdust really flies again.

PROPELLER CONSTRUCTION

I. M. FENN
Chicago Vocational School
Chicago, Ill.

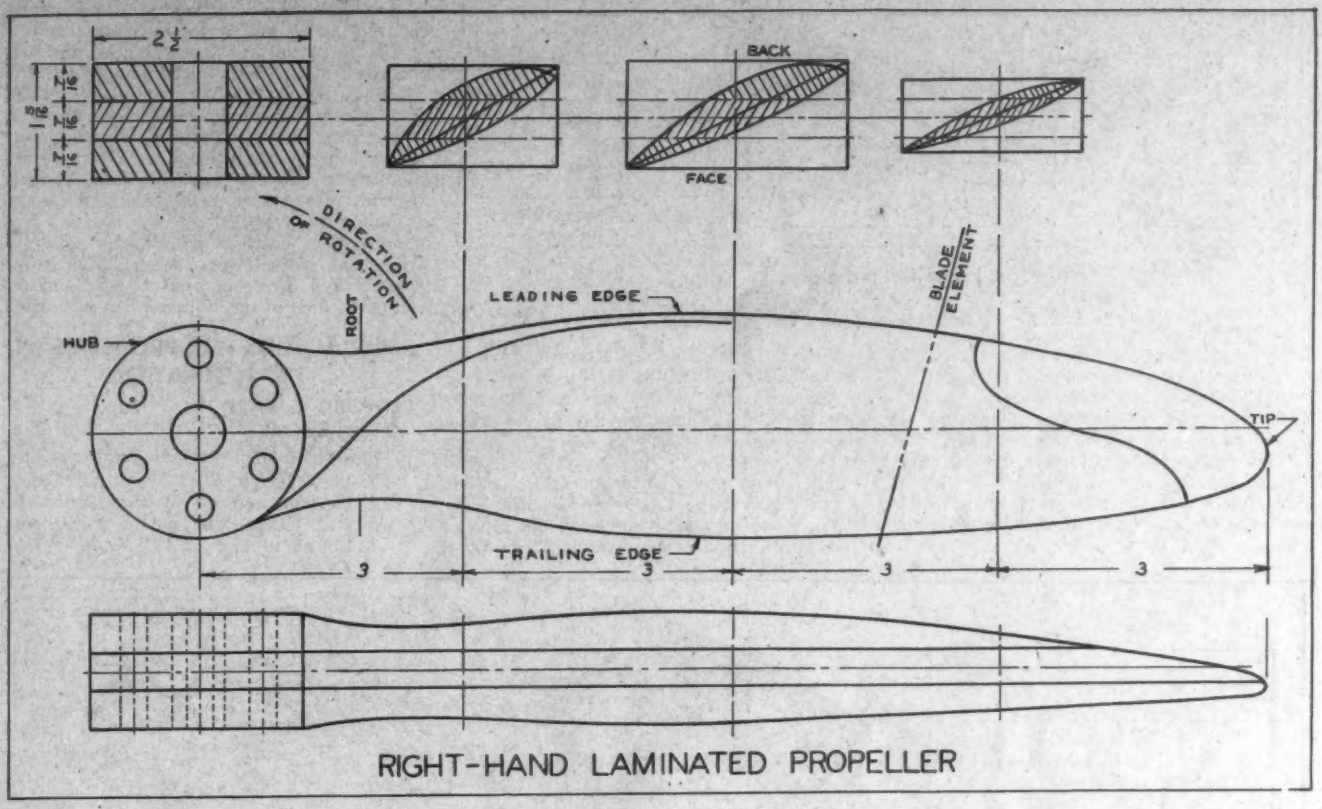
Propeller construction contributes to the preparation of students for more effective participation in the armed forces training program. That means that it makes a good PIT project.

Very little motivation is necessary. Students enthusiastically accept it and put forth their best efforts to complete their "prop" in the shortest possible time.

Propeller construction gives the students an opportunity to learn about pitch and thrust and also allows for the following experiences: blueprint reading, squaring, layout work, template making, using templates, jig-saw operation, band-saw operation, spokeshaving, chiseling, gouging, boring, and finishing.

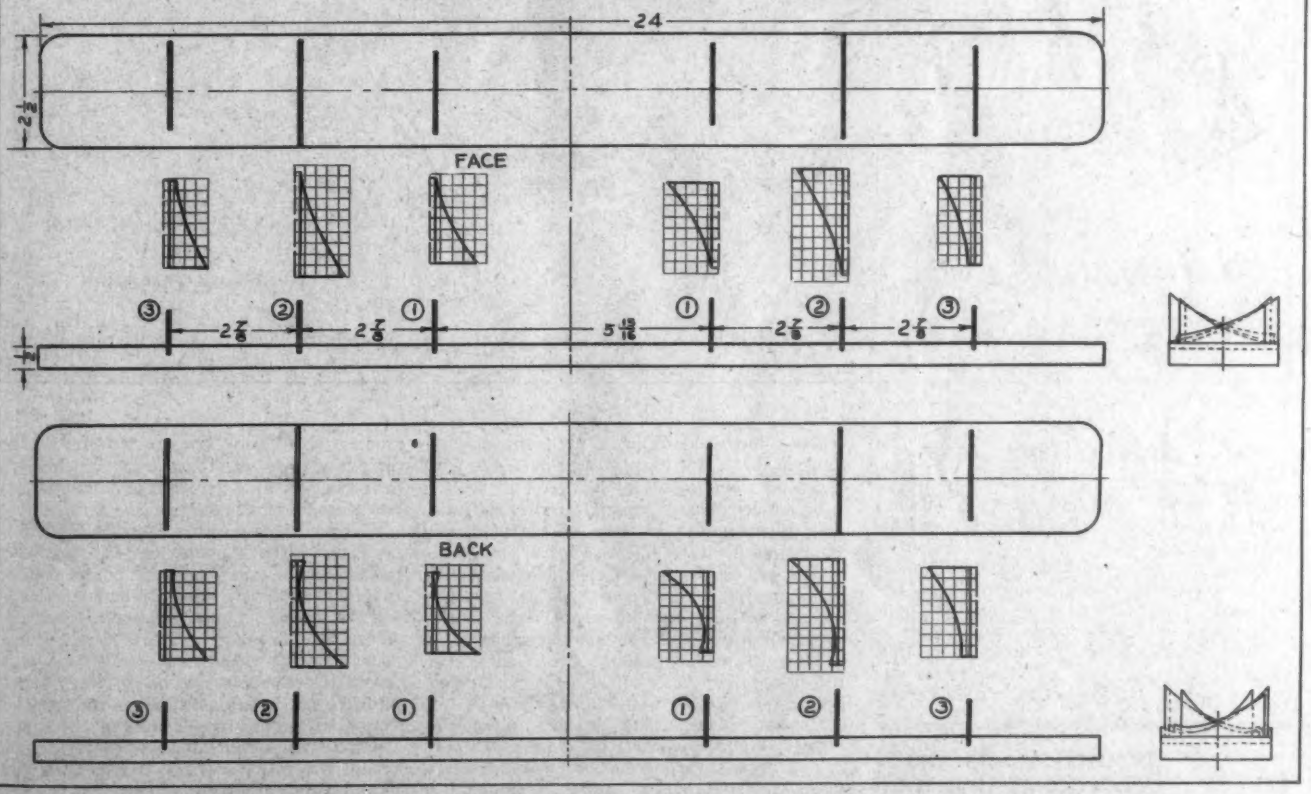
Steps in construction:

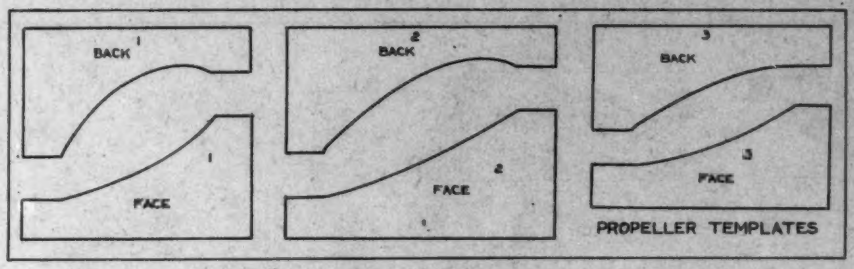
1. Students receive blueprints and material
2. Study and discuss blueprints
3. Lay out templates
4. Cut templates
5. Lay out propeller
6. Cut out propeller



RIGHT-HAND LAMINATED PROPELLER

TESTING DEVICE FOR PROPELLERS





Propeller templates

7. Smooth propeller edge
8. Make layout for pitch on edge
9. Shape propeller — use templates at regular intervals to required pitch
10. Sandpaper and finish blades
11. Test the completed propeller for accuracy with testing device shown

This project helps to further the war effort through conservation of material; it takes as little lumber as the instructor cares to use since the propeller may be constructed in any size.

SAFETY ITEMS

The following items were culled out of "Safety News" published by the National Safety Council, 20 North Wacker Drive, Chicago 6, Ill.

Today and every working day of the year, 17 more American workingmen have unnecessarily lost the sight of one or both eyes as the result of occupational hazards.

Time lost in 1943 due to disabling injuries of workers — on and off the job — was equivalent to a shutdown of the nation's entire shipbuilding and aircraft industries for 38 days.

During the war, accidental deaths have increased most in the 0 to 14-year group.

Approximately 2,300,000 United States workers were injured off the job in 1943, the National Safety Council reports.

Two out of every three bicyclists injured and killed in traffic accidents were violating a traffic law at the time of the accident.

With the current restrictions on vehicles and tires, accidents involving defective vehicles increased from 8 per cent of the total in 1941, to 10 per cent in 1942, and to 15 per cent in 1943.

Based on mileage, special studies indicate that drivers under 20 years of age have the highest accident rate.

One out of five fatal automobile accidents occur on wet, muddy, snowy, or icy roads.

Since Pearl Harbor, there have been approximately 984,000 skidding accidents.

More than 5200 people were killed during the first three years of the war in skidding accidents.

Crossing between intersections causes the largest number of pedestrian deaths.

The greatest number of falls in the home occur on the stairs.

Twenty-five per cent of accidental deaths in farm homes are caused by burns.

Four-fifths of all gas fatalities in 1943 occurred in the home, according to the National Safety Council.

Souvenir shells and weapons sent home by servicemen may still be dangerous. Even though the case may have been emptied, the detonating caps may not have been exploded. Serious injury may result from the careless handling of these shells.

In winter, nearly 4 out of every 10 fatal pedestrian motor vehicle accidents occur during the first three hours after sunset, according to records of the National Safety Council.

VISUAL AIDS FOR PROBLEMS IN TRIANGULATION

CLIFFORD L. YARD
High School
Hastings-on-Hudson, N. Y.

The perplexing problem of getting students to *see* through problems of triangulation may be effected through the use of models such as are shown in Figures 1, 2, and 3. These models are easily constructed from sheet metal and wire, or from cardboard and string or rubber bands, though the latter is more fragile than those made of sheet metal.

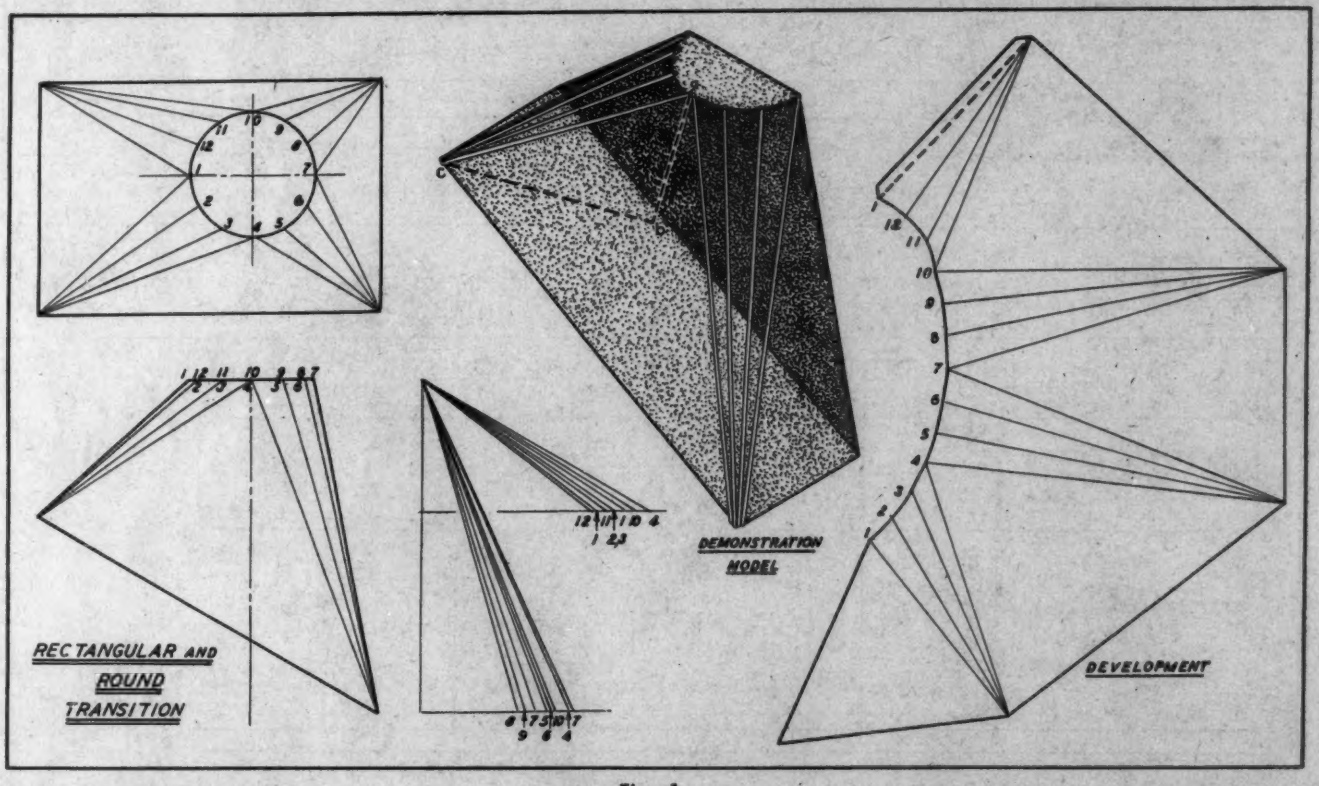


Fig. 1

The model designed to be used first in any given series should have lines laid out (either painted on or wires soldered on to represent the lines) to clearly illustrate how *true lengths* for the sides of the triangles are found as is shown by *abc*, Figure 1. It can then be clearly shown that the length *cb* or the base of the triangle is shown in the top elevation and the altitude, *ab*, is projected from the front elevation to get the true lengths of the sides of the triangles. These models also aid in designating the procedure for triangulation problems because the three-dimensional properties

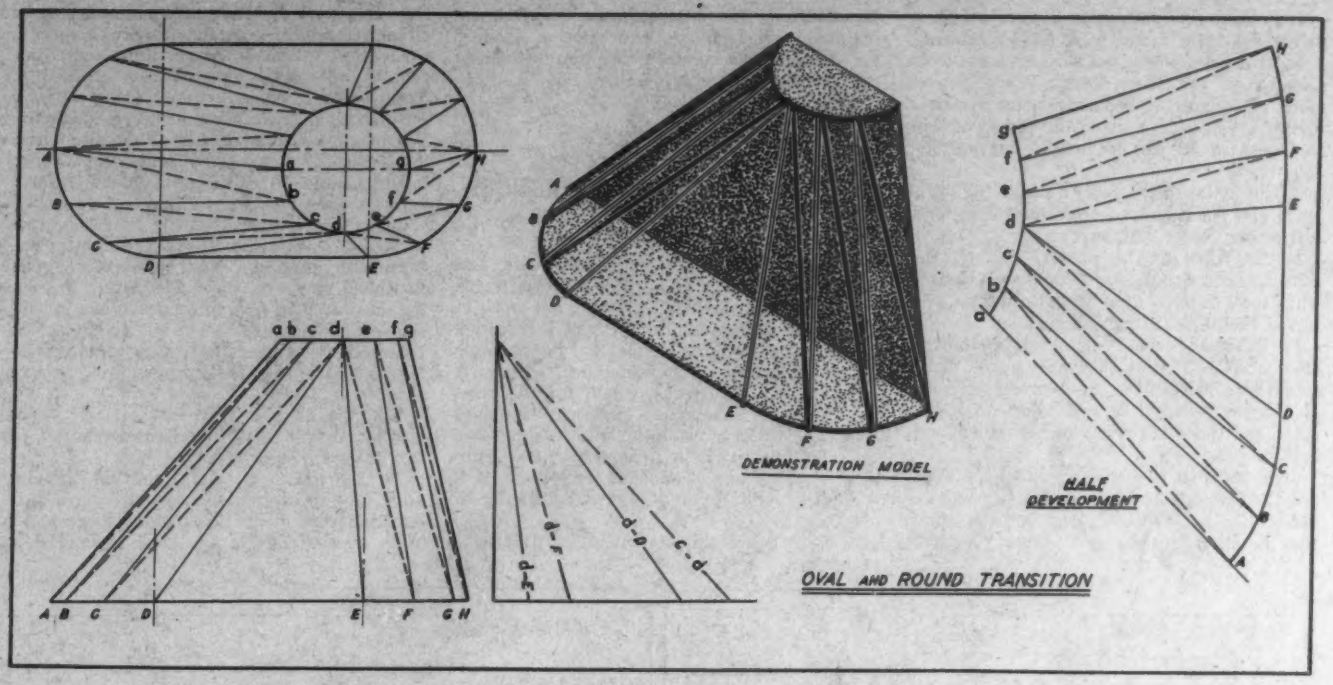


Fig. 2

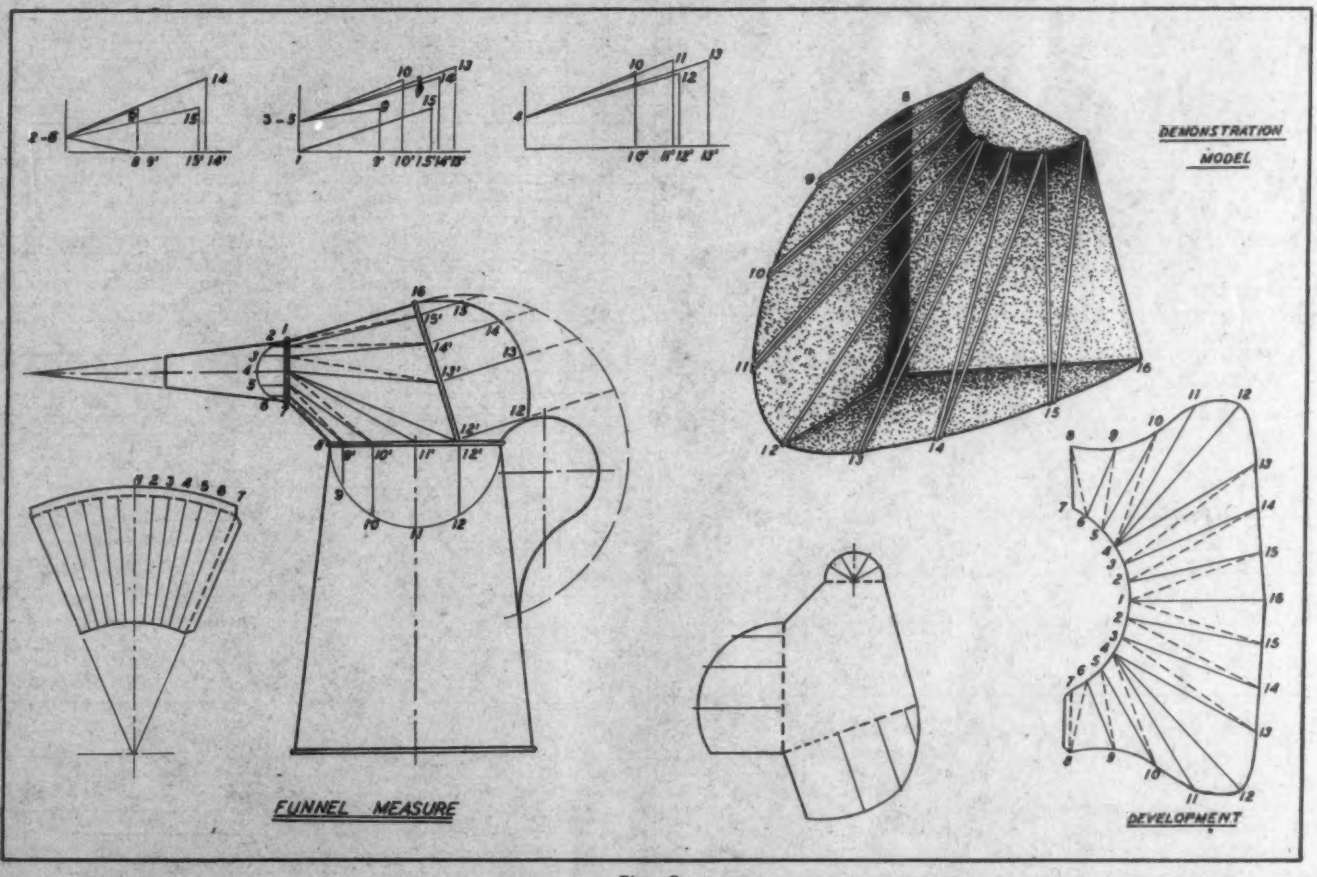


Fig. 3

of the models indicate the necessity of breaking the problem up into *plane* and *curved areas* before proceeding to determine true lengths and then applying these to the construction of the development.

Construction of Models

1. Lay out the center section of the model. This represents a plane which bisects the top and base, preferably in such a manner that the base is cut the long way. This plane is the front elevation in Figures 1 and 3, but must be found by construction in Figure 2 as the centers of the top and base do not lie in a common vertical plane.

2. Lay out half of top and base to be bent at an angle to the center section, Figure 3. This completes pattern for sheet metal or cardboard model.

3. Cement this pattern to a piece of tin or galvanized sheet metal with rubber cement.

4. Drill holes where the wire ends are to be soldered to the sheet metal. When two or more wires meet at the same point (point *c*, Figure 1,) file the ends of the pieces of wire to tapers so all will fit into a single drilled hole.

5. Cut metal to the proper shape, file off all burrs and bend ends to proper angle with the supporting center section.

6. Cut wires to the proper lengths, taper ends as needed and solder in place. Ends of wires may be filed even with the bottom and top of the model after soldering.

7. Paint the sheet metal an appropriate color and then paint the wires a contrasting color. Paint wires different colors as needed — *ab*, Figure 1 should be one color, *bc* another color and the other wires in the same model a third color.

In conclusion it might be said that models are a valuable asset when used wisely but they can easily defeat their own purpose should they be allowed to become a mental prop for visualization. The student must be given an unlimited opportunity to develop a facility for alert and accurate perception of three-dimensional space represented on a two-dimensional media.

HANDY METHOD FOR CALCULATING CIRCUMFERENCES

J. T. SAWHILL
Colorado Springs, Colo.

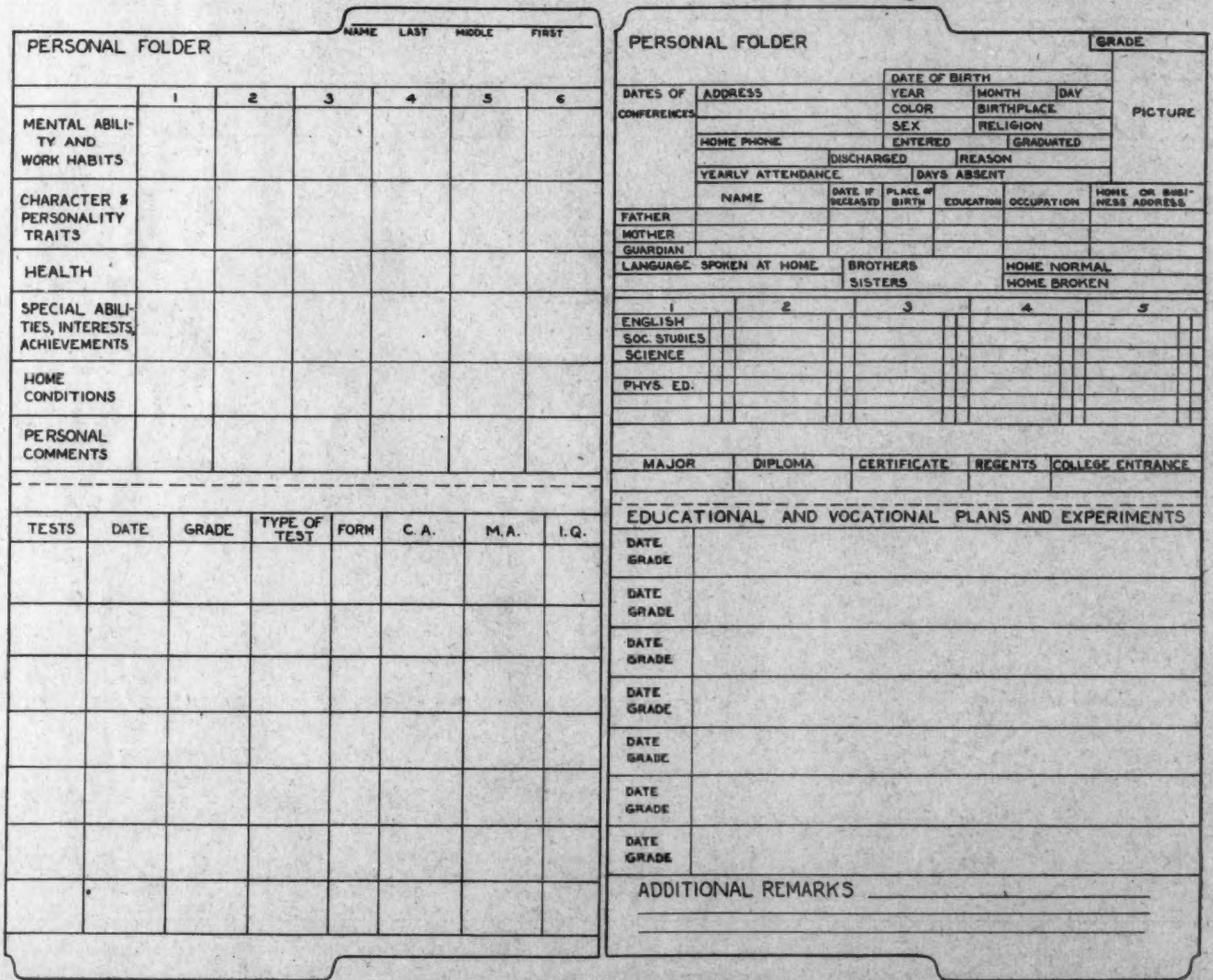
Many circumference scales are in use, and all serve a valuable purpose. Every sheet-metal shop has a ruler for laying out work in which the circumference of circles is required. Few mechanics have studied the metric scale in its application to circumference. The metric centimeter is a perfect key unit for all circles which have diameters given in standard inches. Thus, a circle 10 in. in diameter has a circumference of approximately 80 centimeters. To find the circumference, then, it is necessary only to multiply the diameter by eight.

Let us prove this statement by drawing a few concentric circles and measuring their circumference in centimeters. See Figure 1. On a sheet of smooth paper draw eight concentric circles having diameters of 1, 2, 3, 4, 5, 6, 7, and 8 in. respectively. On a separate sheet draw a circle eight inches in diameter. With compass and dividers lay out this circle in quadrant arcs (90°) and divide each quadrant into 16 equal parts. Number these parts as shown in Figure 2 from 1 to 64.

We now have a circular form of ruler divided into 64 sections. Each section is one centimeter in length. Now to test the circles you have drawn on sheet one. To do this cut out the circular ruler being accurate in cutting exactly to the line. From No. 64 to the center of the circle cut a straight line, making it possible to roll the paper up into a cone shape.

Lay the circular ruler flat on the 8-inch circle and note that the circumference is 64 centimeters.

To test the 7-in. circle roll the circular scale into the form of a cone having a base circumference of 56 centimeters. Place paper clips on the edge of the cone to hold it in



Inside of guidance folder (left) and (right) outside of guidance folder submitted by M. J. Fiore, director of guidance, High School, Tuckahoe, N. Y.

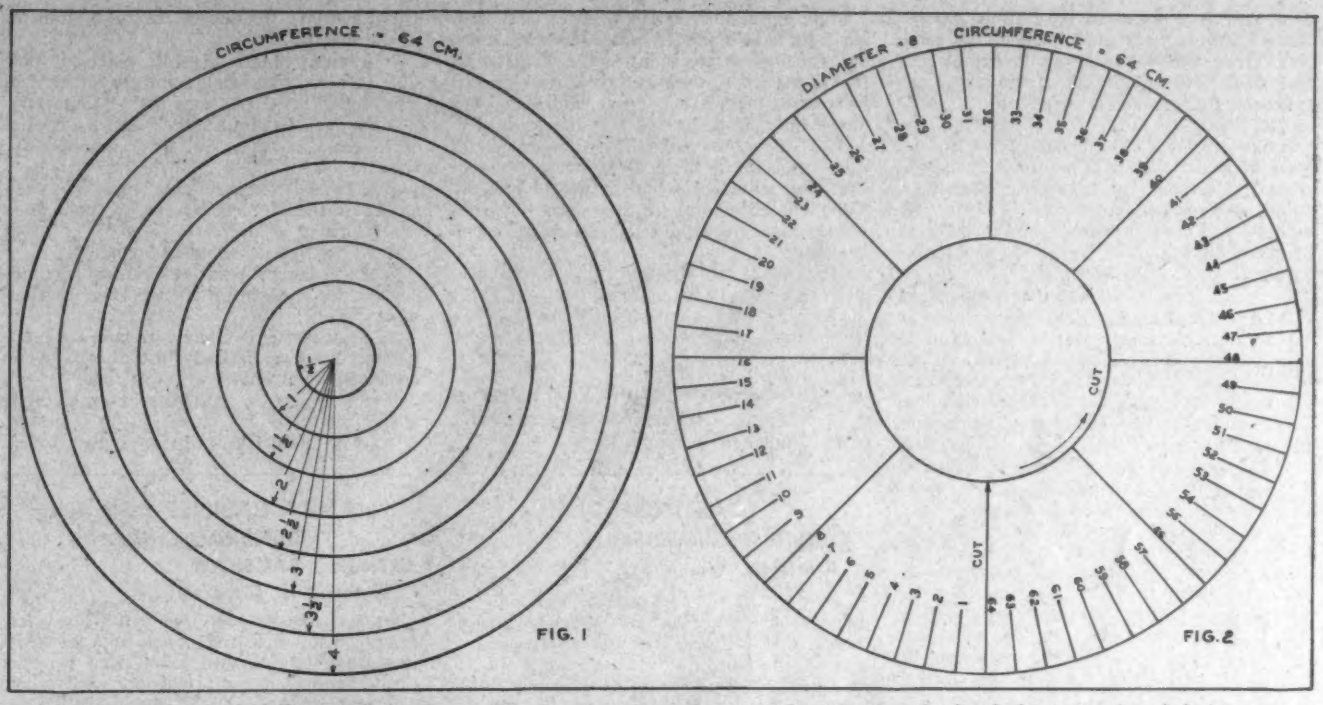


Fig. 1. Circles of different diameters. Fig. 2. The circumference of an 8-in. circle divided into 64 equal divisions

shape. Set the cone on the 7-in. circle, and note that the circumference is exactly 56 centimeters. Test, in the same manner, the 6-in. circle. Roll the cone to smaller size, place the paper clips at 48. Set the cone on the 6-in. circle, and note that the circumference is 48 cm. For the 5-in. circle set the cone at 40 centimeters. We find that each circle is quite accurately measured by this method. Also that each ⅛ in. added to any diameter will add exactly one centimeter to the circumference of the enlarged circle.

From Circumference to Diameter

Rule: Divide the circumference (given in centimeters) by eight to find the diameter in inches.

Thus, a circle has a circumference of 11 centimeters, what is the diameter of the circle? Eleven divided by 8 equals 1⅜ in., which is the diameter.

Uses of the Centimeter

The divisions of the quadrant arc of any circle can be laid off with the compass, and the length of the divisions in centimeters computed. Thus, a circle 4 in. in diameter has a circumference of 4 × 8, or 32 centimeters. The quadrant of the 4-in. circle has an arc length of 8 centimeters. Note that the quadrant arc is two times the diameter in inches.

The quadrant of a 6-in. circle contains 2 × 6, or 12 centimeters.

Stepping Off the Arc

In triangulation, the fact that the arc can be measured in centimeters proves very useful. This method eliminates in many problems the necessity for making a scale drawing for arc length, and greatly speeds the work.

Mathematical Proof of the Co-operation of Scales

Having tested the circles for a practical proof of accuracy, the workman will want mathematical proofs. The relation must be shown between the English and the Metric systems.

Construction: Draw a circle 12⅝ in. in diameter. Compute its circumference by both methods, and compare results.

Metric —

1 meter equals	39.37 in. circumference
12⅝ × 3.1416 equals	39.27 in. circumference
difference in lengths	.10 in. or 1/10 in.

Note that the metric method overruns the mathematical method by 1/10 in. for each meter of circumference. This error is easily corrected since 1/10 in. is approximately equal to 2½ millimeters. The workman, therefore, must deduct 2½mm. when drawing a stretchout line of one meter in length.

The overstatement of arc length amounts to one millimeter for each forty centimeters of arc length. Thus, for a 5-in. circle with circumference stated 8 × 5, or 40 cm. the lengths will compare thus:

40 centimeters equals 40 × .3937 or	15.7480 in.
5 in. × (3.1416) equals	15.7080 in.
difference	.04 in.

1 millimeter equals .03937 in.

Note that the metric method overruns by .04 in. or 1mm.

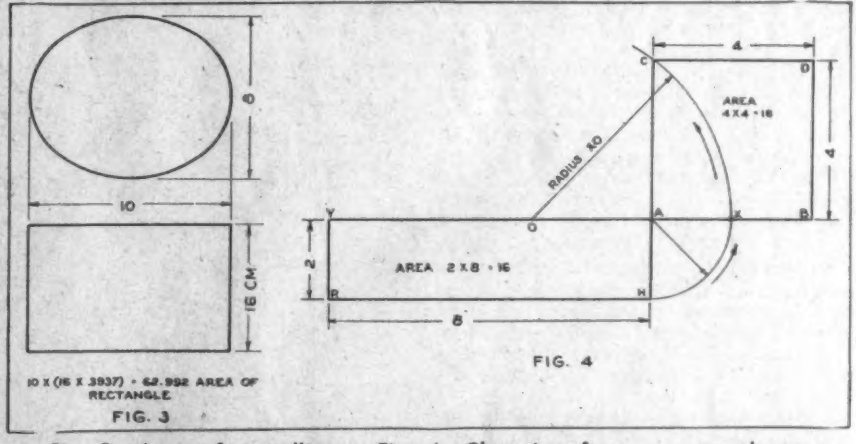


Fig. 3. Area of an ellipse. Fig. 4. Changing from a rectangle to a square

Few sheet-metal workers can obtain such close results from the standard rules, as are possible by the use of the two scales in co-operation, the English scale for diameters, and the centimeter scale for circumferences.

Areas of Circles

The sheet-metal worker often finds it necessary to change a circular or elliptical area to the form of a rectangle or a square. The centimeter proves very useful in this construction. Draw a circle 1 in. in diameter. To draw a rectangle having the same area as the circle lay off the base of the rectangle 1 in. in length and the altitude 2 cm. The area is found thus, 2 cm. equals 2 × .3937 in. or .7874 in.; multiplying by the base gives 1 × .7874 or .7874 sq. in. The area of a 1-in. circle is .7854 sq. in.

By using for the altitude a number two times the base we can construct with the two scales a rectangle having approximately the

same area as a circle. Given a 10-in. pipe to connect with a rectangular pipe of the same area. Draw the rectangle by laying off the base 10 in. and the altitude 20 cm.

Proof: 20 centimeters equals 20 × .3937 or 7.874 in.

Area (10 × 7.874) equals 78.74 sq. in. Note that the number of centimeters used is always two times the number of inches. A 10-in. circle has an area of 78.54 sq. in. By taking the 20 cm. measure (shortened by ½ of one millimeter) we obtain the exact area required.

Area of the Ellipse

By the same method used for circles we can lay off a rectangle equal to the area of an ellipse, as shown in Figure 3. Given: An ellipse 8 by 10 in. to construct a rectangle having the same area. (Note: either the minor axis 8 or the major axis 10 may be doubled for the centimeter measurement.) If the 10 is doubled the rectangle will have a length of 20 centimeters and an altitude of 8 in. Draw this rectangle and compute its area. Area: (8 × 20 × .3937) or 62.9920 sq. in.

The second rectangle can be drawn by using 16 centimeters for the altitude and 10 in. for the base, giving the same area though a different shape for the rectangle. Area: (10 × 16 × .3937) or 62.992 sq. in. The exact area of the ellipse is found by multiplying the major axis by the minor axis and by .7854 or 62.8320 sq. in.

The workman finds that by the use of the two scales he is able to lay off the required rectangles, and that by correcting the overrun he can have exact results in the areas of the rectangles.

From Rectangle to Square

A rectangle can be changed to a square form having the same area, as shown in Figure 4. Draw a 2 by 8 rectangle. Its area is 16 sq. in. Letter the upper right corner A, and extend the lines forming the top of the rectangle and the right side of the rectangle. On line AB lay off a distance equal to the altitude of the rectangle, locating point X. The line XY is then equal to the length of the rectangle plus the altitude (8 + 2 = 10 in.). Then bisect line XY, locating the center point at O. With radius XO and O as center, swing arc XC. Line AC is one side of the required square, and is 4 in. long. The square ABCD, therefore, has an area of 16 sq. in.

The same construction will give the required squares for the circle and for the ellipse described before.

Patterns for Cones

The centimeter proves useful in laying out patterns for cones. The slant height of the cone is the radius for the *pattern circle*. To construct a cone having a slant height of 4 in. and a base of 5½ in. diameter multiply 8 × 5½ to find 44 centimeters, the required circumference of the base.

The centimeter unit greatly simplifies the study of circumference. Draw a 12-in. circle (6-in. radius) and study some of the cones that can be made from such a circle. By dividing the circumference into 8 × 12, or 96 centimeters we can compare the various cones each having a slant height of 6 in.

Lay off a 3-in. cone, a 4-in. cone, and a 5-in. cone. Note that their combined diameters equal exactly 12 in., the diameter of the pattern circle. Their combined circumferences equal 96 centimeters (3 × 8) plus (4 × 8) plus (5 × 8). The total curved surface of the 3 cones equals the area of the 12-in. circle.

Make up another series, 6 cones each having 2-in. base diameter, note that their combined diameters are equal to the diameter of the 12-in. circle, their curved surfaces equal to the area of the 12-in. circle, and their combined circumferences equal to the circumference of the 12-in. circle. Thus the centimeter unit furnishes a method of comparison of arcs and areas not found in the pi method, since it is difficult to see the relation of parts when values are expressed in lengthy decimal fractions.

It is not at all necessary that the student and the workman be confused by pi (3.1416) in working with circumference, because the centimeter unit method makes it much simpler.

Advantages of the Centimeter as a Key for Circumference

1. Results are accurate.
2. Lines are full length, ready to transfer to the metal.
3. A mere change of scale makes it possible to work with whole numbers rather than with complicated fractions (8 × diameter).
4. A meter stick on each bench supplies each workman with his own circumference rule.
5. Standard Circumference rules, however, are not made obsolete by this method. They are as useful as ever.
6. Much time is saved in layouts.
7. An accurate unit is furnished for circumference stepping in triangulation developments.
8. The overrun is easily corrected (one millimeter to 40 centimeters) in order to obtain exact measurements.
9. Any workman can learn the method in a few minutes.
10. The method introduces no new tables.

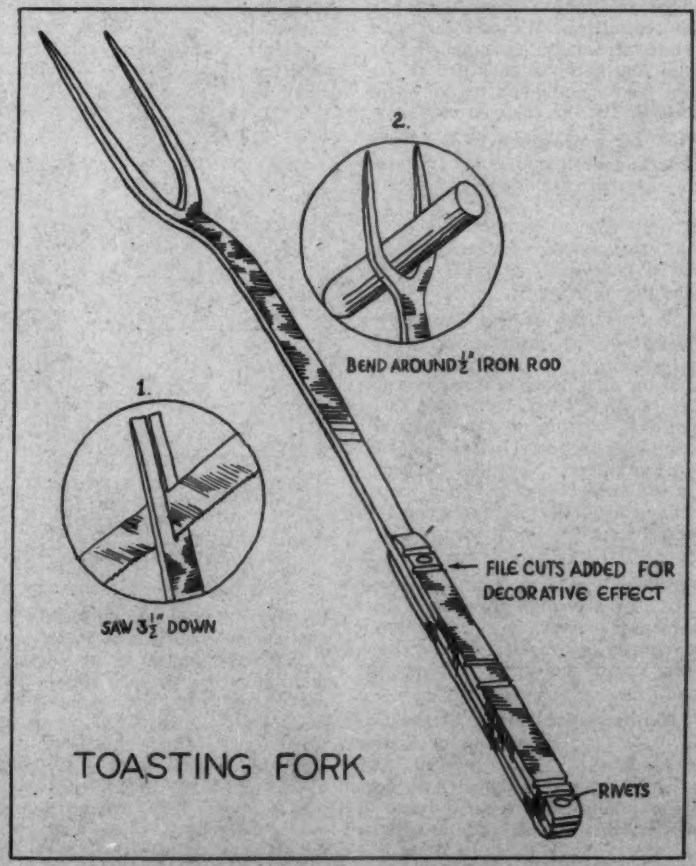
TOASTING FORK

KENNETH KUEMMERLEIN
Appleton, Wis.

All parts of the fork, described herein, are made from ⅛ by ¼-in. band iron. The fork blade is 17 in. long. The two-handle sections are 6½ in. long.

All exposed parts of the fork should be filed smooth and bright. The handles are filed and polished with steel wool. The prongs of the fork are first filed to a taper on the flat side; then slit down the center for a distance of 3½ in. The prongs are then filed to a point and polished with steel wool.

The handles, top and bottom, are riveted with ⅛-in. round rivets to the blade section.



Toasting fork submitted by Kenneth Kuemmerlein

HANDY CABINET FOR THE GENERAL SHOP

ARTHUR L. BAGSHAW
Victoria, B. C., Can.

In a composite shop where drafting, electricity, metalwork and woodwork are given the cabinet here shown is one that has met the writer's need and is possibly what others are looking for, too. While this drawing shows a single cabinet, I made two, joining them back to back, the only difference being that in place of the shallow drafting trays and three small drawers a full height cupboard with panel door was used. This is a handy place to keep wall charts, and the like.

The large drawers are made to take the

BILL OF MATERIAL (Finished sizes)

Part No.	No. of Pcs.	Name	Material	Size
1	1	Top	Fir	¾ x 15 x 28¾
2	2	Sides	Fir	¾ x 15 x 56½
3	1	Center board	Fir	¾ x 14¼ x 56
4	4	Rails	Fir	¾ x 2 x 17½
	8	Runners	Fir	¾ x 2 x 12¼
4a	2	Rails	Fir	¾ x 2 x 11
	4	Runners	Fir	¾ x 2 x 12¼
5	1	Bottom	Fir	¾ x 15 x 27¾
6	1	Back	Plywood	¼ x 28¼ x 56½
7	1	Locking bar	Fir	¾ x 3 x 56
8	2	Base	Fir	2 x 3 x 27¼
9	2	Base	Fir	2 x 3 x 9
10	2	Drawer fronts	Fir	¾ x 10½ x 10
	4	Drawer sides	Fir	½ x 10½ x 13¾
	2	Drawer backs	Fir	½ x 9⅞ x 8⅞
	2	Drawer bottoms	Plywood	¼ x 13½ x 8⅞
10a	5	Drawer fronts	Fir	¾ x 10½ x 16½
	10	Drawer sides	Fir	½ x 10½ x 13¾
	5	Drawer backs	Fir	½ x 9⅞ x 15⅜
	5	Drawer bottoms	Plywood	¼ x 13½ x 15⅜
11	30	Trays (fronts)	Fir	¾ x 1 x 10
	60	Trays (sides)	Fir	½ x ¾ x 13½
	30	Trays (backs)	Fir	½ x ¾ x 8⅝
	30	Trays (bottoms)	Plywood	¼ x 10 x 13¾
12	1	Drawer front	Fir	¾ x 3 x 10
	2	Drawer sides	Fir	½ x 2¾ x 13½
	1	Drawer back	Fir	½ x 2¾ x 8⅝
	1	Drawer bottom	Plywood	¼ x 10 x 13¾
13	62	Runners (trays)	Fir	⅜ x ¾ x 13½
14	1	Lock		
	7	Drawer pulls	Brass or wood	
	31	Knobs	Brass or wood	
		Partitions for trays ⅜		½ length as required

Bill of materials for handy cabinet

average office folder. Here are kept test papers, job sheets, information sheets, folders for project planning material, procedure sheets and other items that the instructor wishes to keep on file.

The shallow drafting trays contain a rule, eraser, thumb tacks, compass, pencils, and 45 and 30-60 deg. set squares. Each tray is numbered and as each boy is given a number it is easy to check on any misuse of equipment. See bill of materials above.

A locking bar, bare faced tenoned at the bottom, fits into a mortise in the bottom board and has a cabinet or chest lock at the top.

The center partition fits into the top and bottom boards by a stopped housing joint.

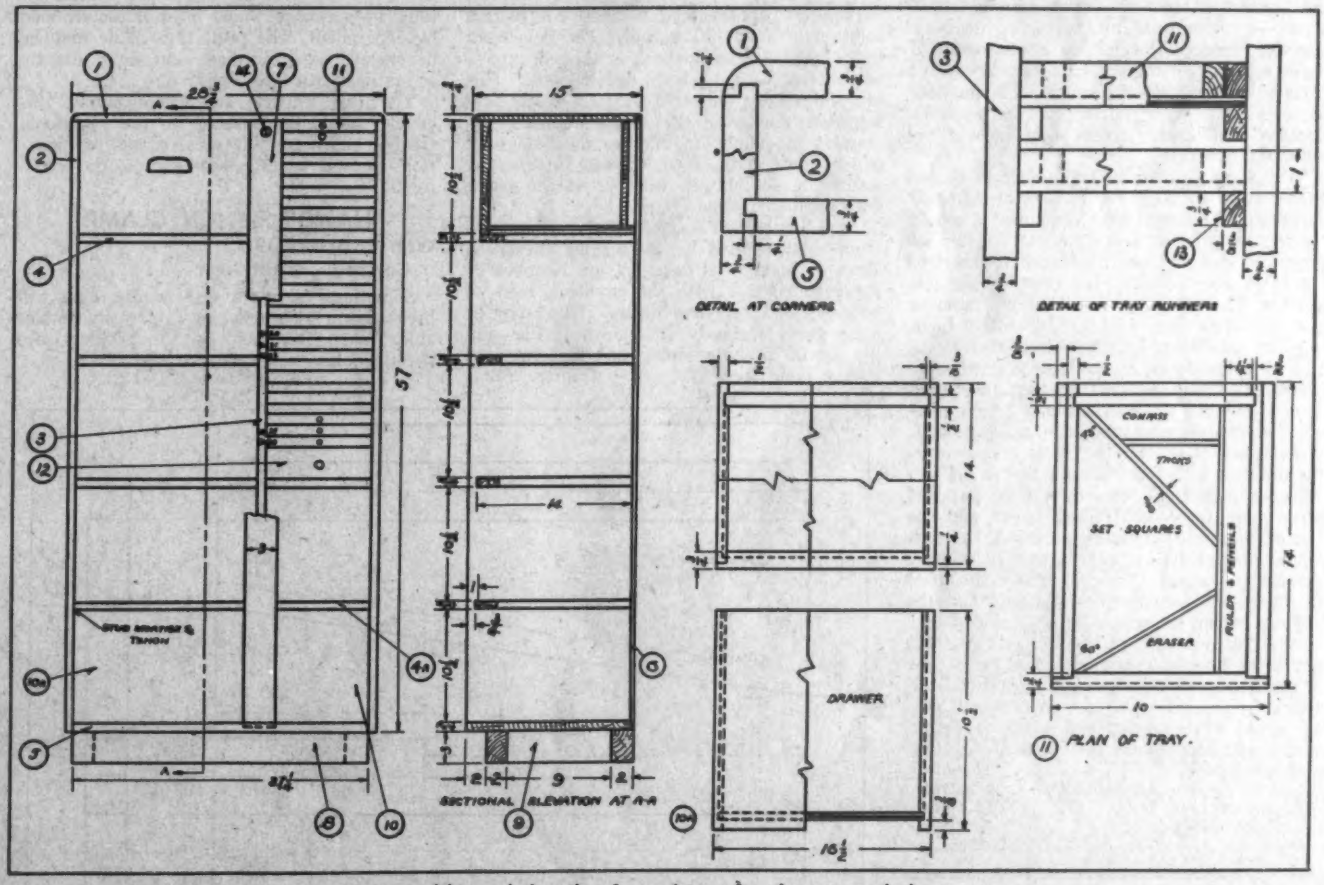
The top and sides are fitted together with a stopped rabbeted dado joint. The same joint may be used for the bottom.

PHOTOGRAPHIC DUPLICATIONS WITHOUT A CAMERA

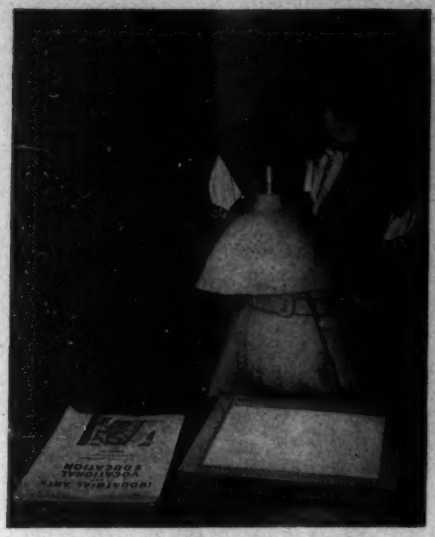
R. H. BEHRENS
Berkeley, Calif.

The problem of duplicating line drawings, diagrams, and printed matter is of particular concern to the vocational teacher. Changes in materials of construction and rapid shifts in the technique of dealing with them demand a constant modification of teaching aids. For the reproduction of line drawings the blueprint has yet to be excelled for simplicity and economy. Blueprinting, however, usually requires the previous preparation of a transparency — a time-consuming operation for the busy vocational teacher.

A relatively simple method for duplicating not only line drawings but printed matter and coarse half tones (42 lines per inch) as well is that of reflex printing. By placing the sensi-



Assembly and details of a cabinet for the general shop



A large photographic printing frame and a 100-watt lamp in a reflector may be used for making the paper negative by the reflex printing process

tized surface of a sheet of photographic printing paper into intimate contact with printed matter to be copied, and directing a strong light through the back of the photographic paper, it will be found that the light reflected from the white background of the printed original to the sensitized emulsion on the photographic paper will be much greater than that reflected from the dark printed characters or lines, in this way producing a negative image. By selecting a photographic paper with a very short range of tones and correctly timing the exposure it is possible to obtain a photographically sharp paper negative from which copies may be made in unlimited numbers.

Very simple apparatus will suffice to secure good results although some pieces of standard darkroom photographic equipment would render the printing more simple. A plate of glass and two or three photographic developing trays are sufficient for carrying on this process. The addition of a printing frame or box, light reflectors, and stands, greatly facilitate the production of copies in quantity.

A drawing from a magazine may be reproduced by placing over the page to be copied a piece of plate glass to flatten it. A sheet of very contrasty photographic printing paper (similar to Velox Number 5) is placed upon the drawing with the emulsion side in contact with the page to be copied. A clear piece of plate glass is placed on the paper and the two pressed into intimate contact. A 100-watt lamp, preferably in a reflector, held at a distance of about 18 inches above the glass is turned on for about 20 seconds and the exposed paper, on removal, is developed to a clear black and white in M–Q (Eastman D72) developer of double strength. The exact time of exposure and development must be determined by experiment. A developer which may be mixed when needed and which is particularly well adapted for this work is:

Hydroquinone	11.0 gms
Sodium sulphite (Anhydrous)	14.8 gms
Potassium bromide	1.1 gms
Sodium hydroxide	12.5 gms
Water	1000 cc.

Paper negative prepared from magazine illustration

Print made from negative

Exposed paper should develop out in this solution in about 20 seconds. The developed paper negative so formed is dipped into a short stop bath to stop development. This may be a very dilute (2 or 3%) acetic acid solution. Following the short stop, an immersion for about 15 minutes in a standard paper fixing bath, then washing in running water for 30 minutes will permit the paper negative to be dried.

Any number of copies may be prepared from this negative by placing an unexposed sheet of highly contrasty (Velox Number 5) paper in contact with the emulsion sides of both pressed together firmly. This may be done very efficiently, as shown in the cut, by use of a photographic printing frame. A strong light is held on the negative for a time and distance which must be determined by experiment. The print thus made may be developed, fixed, washed, and dried exactly as outlined for the negative.

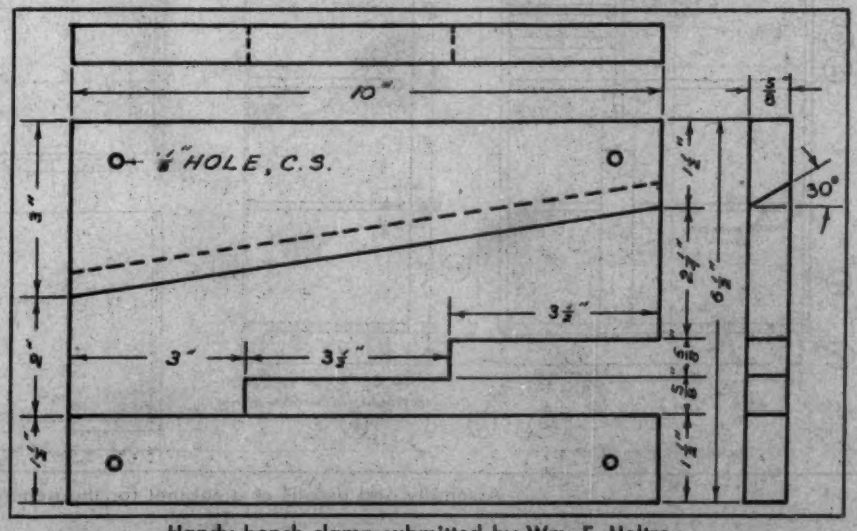
The two illustrations accompanying this article should demonstrate to the vocational teacher many possible uses of this reproduction method in the shop and in the classroom.

HANDY BENCH CLAMP

WM. F. HOLTROP
Corcoran, Calif.

Sometimes a bench vise in the shop will break down, with new parts not easily obtainable. When this happens, the bench clamp described here may prove useful.

(Continued on page 188)

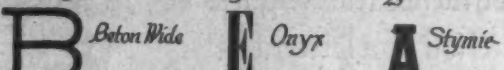


Handy bench clamp submitted by Wm. F. Holtrop

HOW ARE NEW LETTERS DERIVED?

The designer must be thoroughly familiar with all basic letter forms.

ABCDEFGHIJKLMNOPQRSTUVWXYZ

These basic forms are changed by applying a "formula" to each letter so a strong sense of unity will be present throughout the alphabet. The formula may call for: 1. Expanding or contracting 

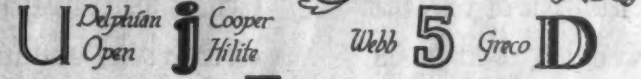
2. Exaggerating some part

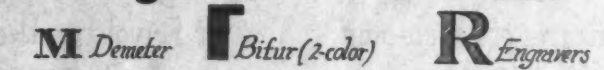
3. Changing direction or position

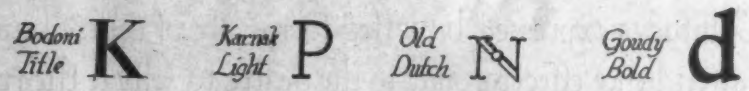
4. Changing the linear nature of elements making up the letter by

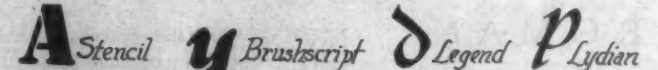
a. Effects of shadow

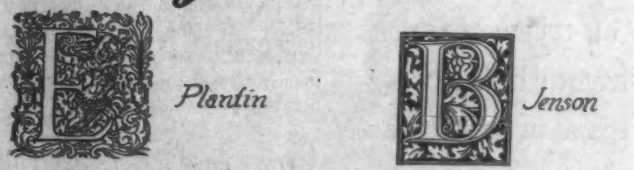
b. Naturalistic treatment

c. Opening the lines 

d. Shading the elements 

5. Changing the serifs 

6. Imitating another technique 

7. Adding a background 

As a rule the letter forms of greatest general utility & longest favor are those departing but little from basic forms. Others may have strong but brief attractiveness.

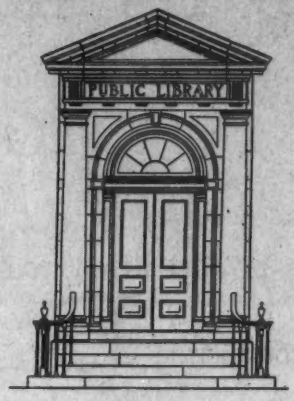
Plate 54. Design course by Burl N. Osburn, director of industrial arts, State Teachers College, Millersville, Pa.

WHAT IS AN APPROPRIATE LETTER FORM?

ELEGANT

19th Century

Historical association may influence the designer's selection of a letter, to the extent that custom must



Roman Architecture & Letters

Holy Bible

Gothic Blackletter

be observed, correctness is desired, or "atmosphere" is sought. The latter usually calls for moderation.

Letter forms may, under some circumstances, be used to help suggest the thought

Stop	SO SOLLY	ADMIT ONE
STOP	**We regret**	**admit one**
STOP	WE REGRET	*Admit one*
Stop	*We Regret*	ADMIT ONE

The tone of voice that would be used has a degree of "carry-over" into letter forms.

Letters may reveal insincerity, a bold blatant voice, or frivolity. They may convey quiet conservativeness.

In some instances the meaning, alone, has little or no influence on letter selection.

Attitudes expressed by letter forms are, of course, largely a matter of association, hence effective only to the degree to which the reader knows and recognizes the relationship. The manner of use is equally important.

ROMAN

The roman capital frequently is letterspaced in formal use to convey an air of dignity & permanence.

NOW, the moral side of an industry, productive or unproductive, the redeeming and ideal aspect of this bread winning, is the attainment of the highest possible skill on the part of the craftsman. Such skill, the skill of technique, is more than honesty.

Lower case letters are employed in extended passages for ease of reading.

Catherine

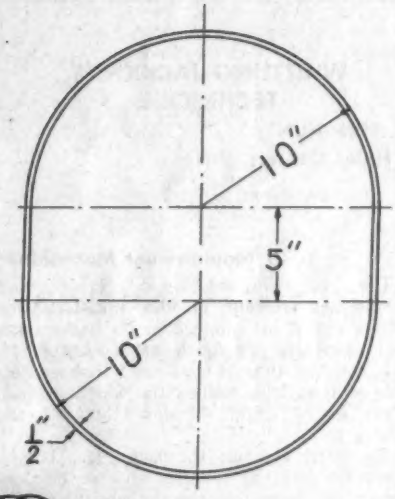
The black letter and most script forms are never letterspaced or used in all capital forms.

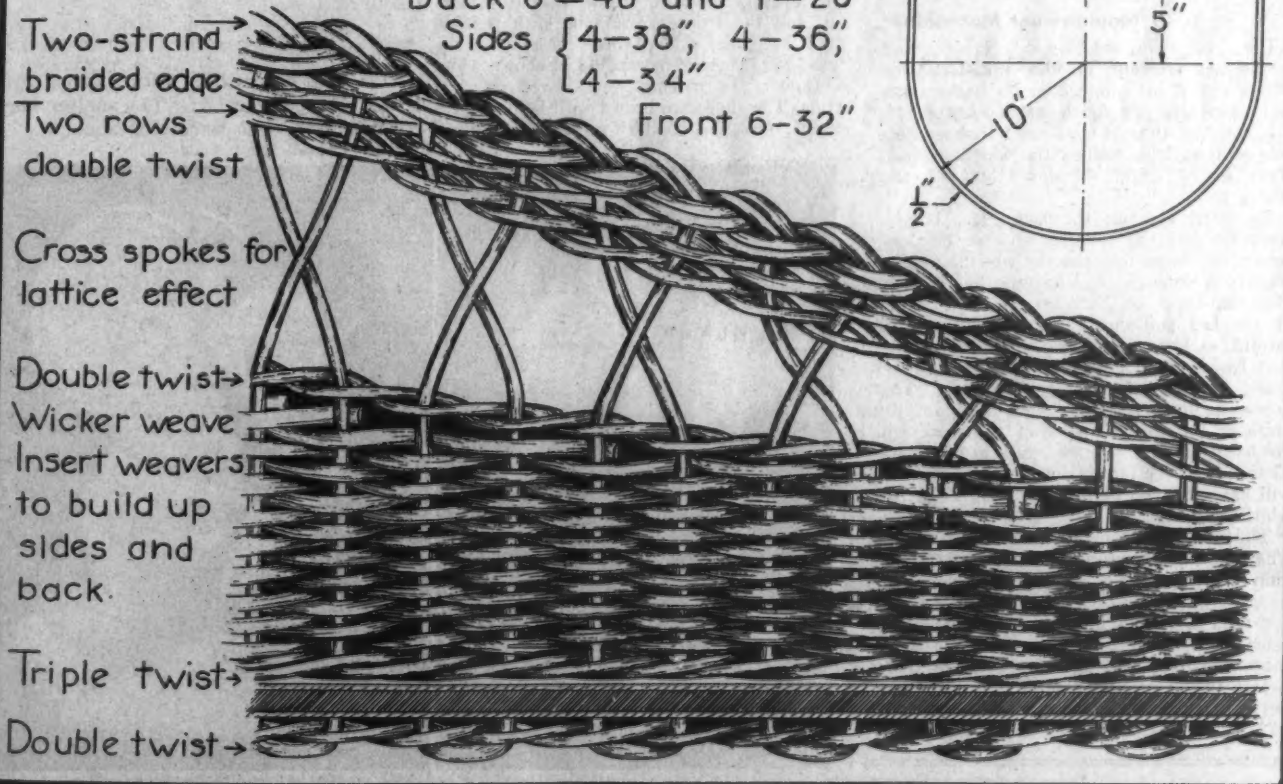
Plate 55. Continuation of design course by Burl N. Osburn, director of industrial arts, State Teachers College, Millersville, Pa.

A DOG BASKET

Oval base is cut from $\frac{3}{8}$" plywood. Drill 55 holes evenly spaced $\frac{1}{2}$" from the edge. Graduated spoke lengths are cut as follows:

Back 8—40" and 1—20"
Sides {4—38", 4—36", 4—34"
Front 6—32"





Dog basket submitted by Louis V. Newkirk, director of industrial arts, Chicago, Ill.

Fig. 172. Full-size pattern of the mountaineer

WHITTLING-JACKKNIFE TECHNIQUE

W. BEN. HUNT
Hales Corners, Wis.

(Continued from page 22A of the March, 1945, issue)

Mountaineer Moonshiner

The old white-whiskered, mountaineer moonshiner trudging up the mountain lane with a keg of his product on his back makes a fine whittling job. As shown in Figures 172, 173, and 174, the old man has a frown on his face as though he wished the whittler would hurry so he could set down his keg and take a rest.

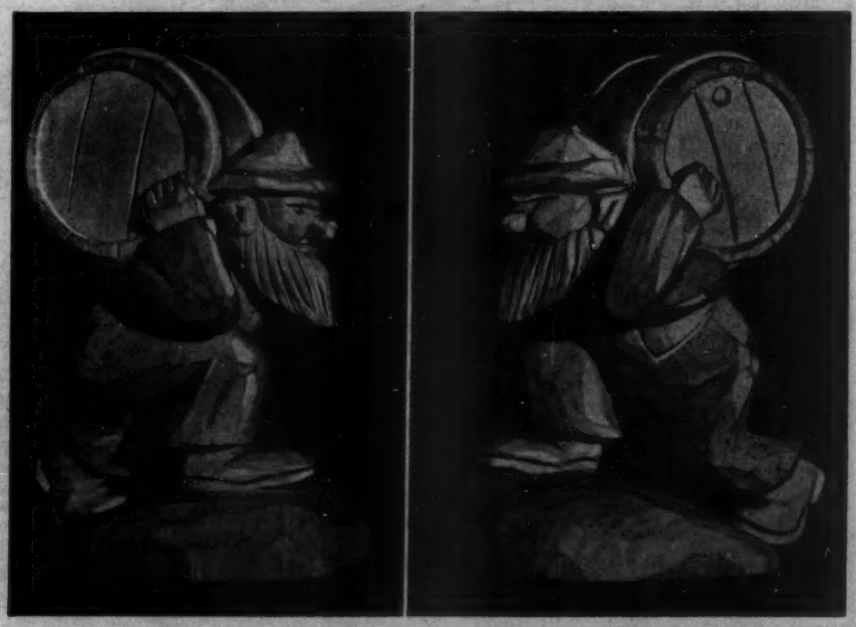
To start, cut out the silhouette. If you don't saw out the opening between his legs, bore a few holes to make the whittling easier when you come to cutting out that section. Start whittling at the top. Get the width of the keg and cut away the sides, being careful to leave wood for the hands. After that has been roughed out, do the legs and arms, leaving the face for the last. This procedure is suggested because a slip of the knife in the earlier stages of the work will not harm the face when it is still in the rough. Then, too, if the face is done last, the whittler will have the feel of it better than if he had whittled it first.

The rough whittling shown in Figure 174 is what the south-eastern mountain people call chip carving. You may wish to finish your figure so that it is real smooth all over. But for such a rugged individual as this mountaineer seems to be, chip carving is much more effective. The photographs were taken before the figure was painted, so as to show better, how the knife cuts are made. Figures 172 and 173 also show the knife cuts. Don't try too hard to follow these cuts. Just go ahead your own way and try to make each cut count. The keg is roughly whittled to look like a real keg. Ends are set in and hoops stand out. The hoops are exaggerated but that adds to the general effect.

Color the keg a brownish gray with black or darker hoops. The mountaineer's hat is light brown, the shirt yellow, the suspenders red, and the trousers are blue with patches painted on one side of the seat and on the right knee. The stitches should be shown white as though the patches were sewed on with string. The shoes are brown with lighter edges on the sides and on the toes to denote wear. Face and hands are pink, and the cheeks and nose are red. The whiskers are white, and a narrow white streak for eyebrows makes the old mountaineer look rather angry. The eyes are merely black spots. The base is brownish green.

The colors mentioned need not be adhered to and any suitable colors may be substituted.

To deal successfully with a given problem: (1) get the facts, (2) analyze them carefully, (3) do something about it.



Figs. 173 and 174. Two views, showing the right and left-hand sides of the mountaineer

RADIO STUDENT'S CONSTRUCTION KIT

ABRAHAM G. BELESON and THEODORE BENJAMIN
The Fredrick Douglas Junior High School
New York, N. Y.

Due to the shortage of radio equipment many schools have been handicapped and are having a difficult time carrying on the teaching of radio. We have discovered a way in which one can easily teach radio to a large group, whether it is in the science classroom or in the school shop, by the use of the radio student's construction kit described herewith. Each radio part is printed on a square, as shown in Figures 15 and 15A, so that it can be cut out and used like a building block. The instructor, having the actual parts, can discuss and demonstrate the construction and operation of a given radio hook up. The student learns the symbol and the operation of each part, and having a kit of his own, can soon assemble the building blocks to show how that particular radio circuit is constructed. After studying and using the kit, the student would have no trouble in assembling any set made up by the teacher. With this kit the student can then diagrammatically build all types from the one-tube sets up to the four-tube radio set using both transformer and resistance-coupled amplification. The sets can be shown hooked up to speakers or to earphones.

The information sheet containing the symbols aids in explaining the function of each part of the radio. The students can construct the set along with the demonstration of the instructor. Tests can be given by asking the student to construct a given set by means of his construction kit. As all parts match, the student must know the theory and function of all parts.

This inexpensive method is compact, quick, and simple. With a bit of practice one soon can construct all of the various sets illustrated in this article.

Symbols and Operations of Radio Parts

Antenna — As radio waves speed past a conductor, an electric current is induced in the conductor. This current alternates in one direction at the same frequency as that in the transmitting antenna.

Antenna coil — The alternating current surging back and forth from the antenna through the primary of the antenna coil into the ground induces a similar flow of alternating current in the secondary of the coil.

Ground — Transmitters cause a rapid surge of electrons from ground into the antenna and back into the ground. A similar feeble motion of electrons is induced by the radio wave in the receiving antenna.

Phones — The phones convert varying electric currents into sound waves which vary in time with the fluctuations of the current. By this means the varying current is converted to speech.

Crystal — The radio frequency to which the tuned circuit is resonant is sent into the crystal to be rectified. The phones cannot respond to the high frequency of alternating current but can respond to the audio component of the rectified wave.

Tuning Condenser — The tuning condenser together with the secondary of the antenna coil comprises the tuned circuit which selects from the many radio frequencies received, the single one to which it is tuned. By varying the capacity of the tuning condenser the responding frequency is changed thus tuning to the desired station.

Diode Detection — The fact that the current flows through the tube only when the filament is negative and the plate positive, causes the diode to rectify the radio frequency exactly as does the crystal.

Grid Leak — Radio frequency impressed on the grid flows through the grid leak condenser. The voltage drop across the grid leak resistance supplies the proper grid bias.

Battery "A" — The purpose of the "A" battery is to supply the current to heat the filament to the temperature necessary to cause it to emit electrons.

Battery "B" — The "B" battery maintains a positive charge on the plate and a negative charge on the filament and also supplies the additional energy necessary for amplification.

Detector Triode — The grid and the filament of the triode detector act to rectify the incoming radio frequency. Variations on the grid are amplified in the plate circuit.

Audio Amplifier Triode — Variations at audio frequency from the plate circuit of the preceding tube are impressed on the grid of the amplifier and appear as greater variations in the plate current.

Transformer Coupling — Variations in the primary (connected to the plate circuit of the preceding stage) induce greater voltage variations in the secondary (connected to the grid circuit of the succeeding tube). The transformer thus couples the two stages and provides a gain for amplification.

Resistance Coupling — Voltage developed across the plate resistor R_1 feeds the varying signal to the grid of the succeeding tube. The coupling condenser is needed to keep the large positive voltage on the plate off the grid and at the same time it allows the signal to pass through. The grid leak resistor R_2 allows any charge accumulating on the grid to run off to the ground, thus preventing the effect of a floating grid.

Cathode Bias — The voltage drop appearing across the cathode bias resistor is in such a direction that the grid is made negative with respect to the filament. This secures the necessary grid bias. The large condenser by-passes the audio frequency.

Battery "C" — The function of the "C" battery is to supply the proper grid bias for the tube, approximately 4.5 volts.

Speaker — The speaker converts varying electric currents into sound waves which vary in time with the fluctuations of the current. By this means varying current is converted to speech.

The building blocks contained in this set are to be cut apart. After this has been done, assemble them so as to show the following radio hook ups diagrammatically. In so doing all of the fundamental principles of radio can be illustrated. If necessary, refer to the information sheet containing the symbols and a simple explanation of the function of each part. As you use each part be sure to read the information so that you may understand the purpose.

As a first step, build a crystal radio receiver. Figure 1 shows how the set should look when you have completed its construction.

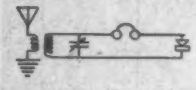


Fig. 1

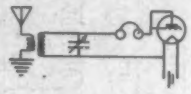


Fig. 2

For more reliable reception substitute the diode tube for the crystal detector as shown in Figure 2.

As yet we have no amplification. The energy entering our phones is only that picked up by the antenna. For amplification let us use grid leak detection, as shown in Figure 3.

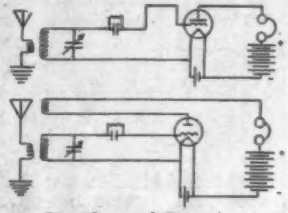


Fig. 3, and Fig. 4

A type of detection used mainly for code reception is the regenerative detector, shown in Figure 4.

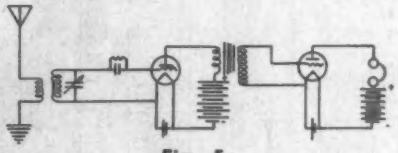


Fig. 5

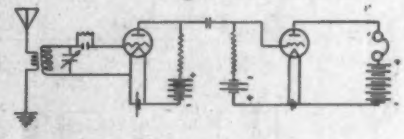


Fig. 6

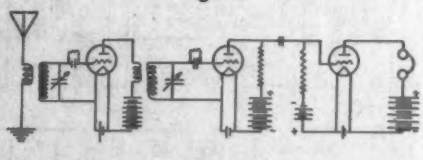
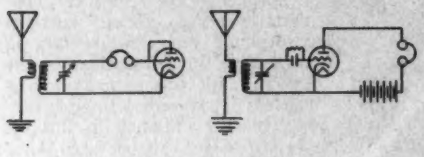


Fig. 7

For further amplification add a stage of transformer-coupled amplification. See Figure 5.



Figs. 8 and 9

For better tone quality use resistance coupling as shown in Figure 6.

Figure 7 shows one stage of radio-frequency amplification, grid-leak detection, and one stage of resistance-coupled audio-frequency amplification.

For heater tubes operating from a.c. filament the circuits look like those shown in Figures 8, 9, 10, 11, and 12.

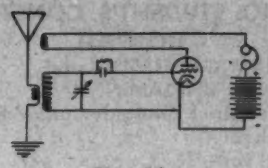


Fig. 10

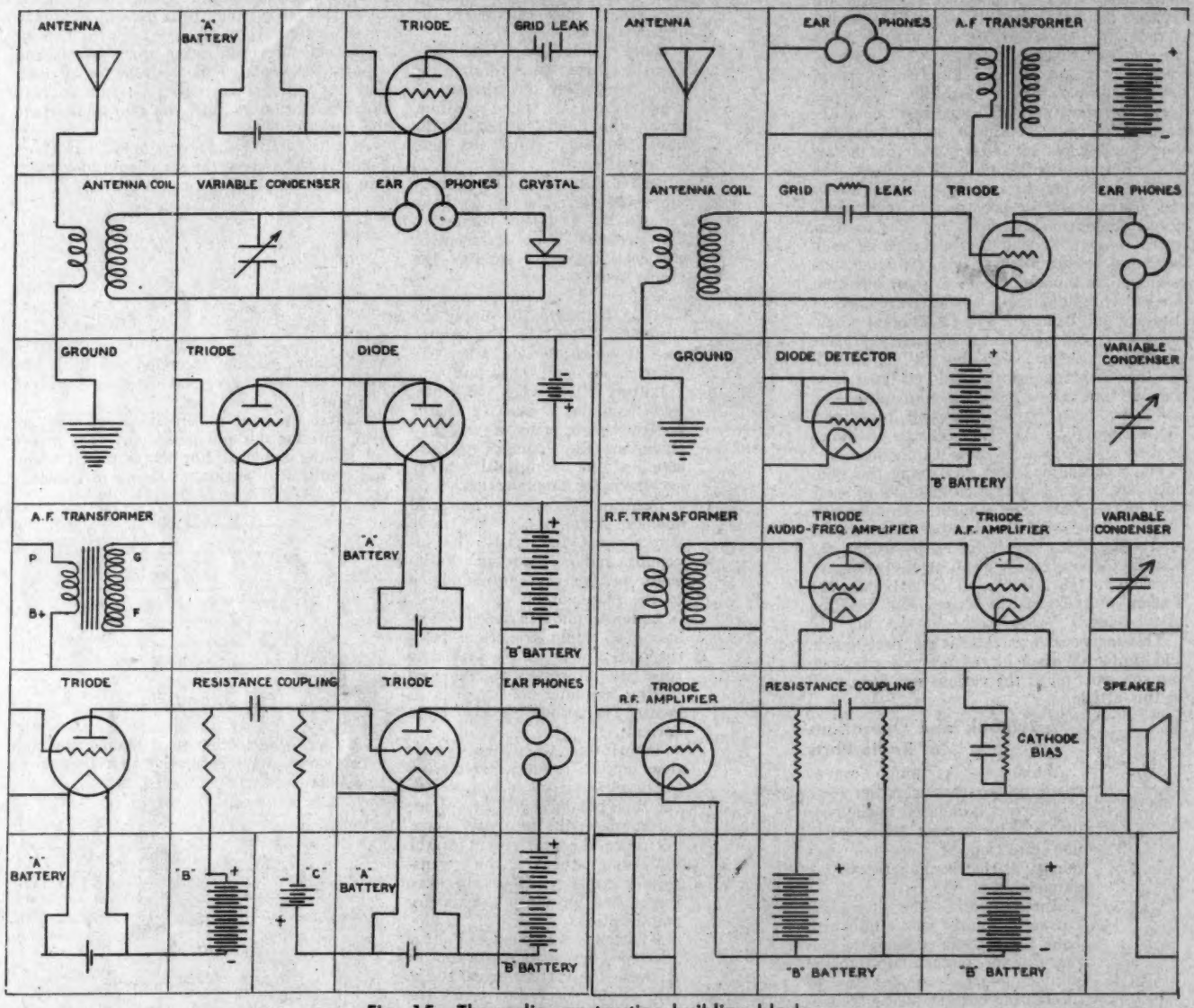
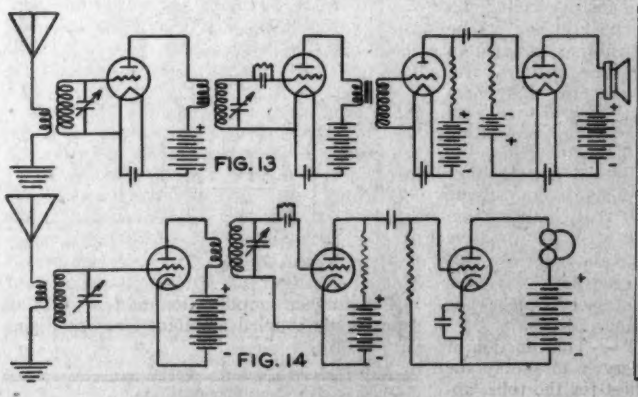
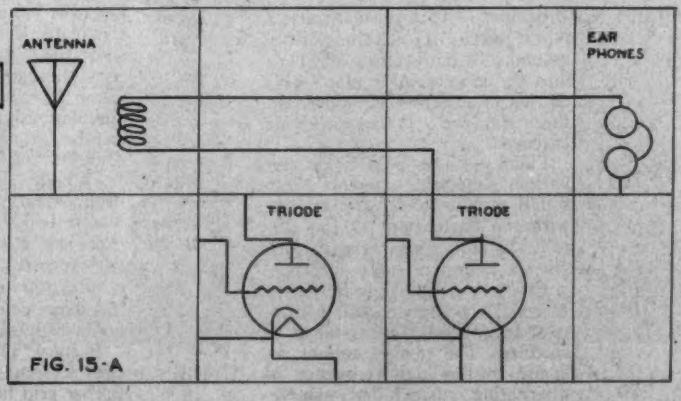


Fig. 15. The radio construction building blocks





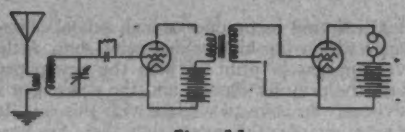


Fig. 11

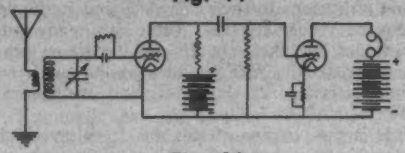


Fig. 12

Figure 13 shows a radio-frequency amplifier, grid leak detector, transformer coupled to a stage of audio-frequency amplification, resistance-coupled to a power output amplifier.

Figure 14 shows a stage of radio-frequency amplification, grid leak detector, and a stage of resistance-coupled amplification.

ORNAMENTAL TIN CRAFT

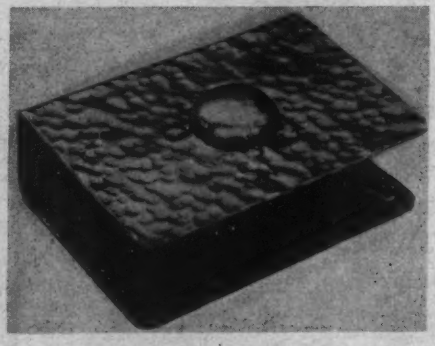
CHRIS H. GRONEMAN
Industrial Education Department
A. & M. College of Texas
College Station, Tex.

(Continued from page 79 of the February, 1945, issue)

Matchbox Holder

The matchbox holder described in this article requires very little time for construction and is a convenient addition in the group of accessories for the smoker. It might be a part of a desk set, an occasional novelty for the smoker's pleasure, or a decorative item on an end table.

Construction is simple, but the bending must be accurate to insure a snug fit on the



Matchbox holder

matchbox. The sizes given in the drawing are standard for such boxes but it is suggested that it be designed to fit the box available locally. The chair glider furnishes unique surface decoration; however, the design may be altered to allow for piercing. Design B shows the addition of the fourth side to hold the matchbox very rigidly. This will require the soldering of one edge. The peened surface makes an excellent contrast to the flat or domed pattern of Design A. It is advisable to make this project from two pieces of tin plate sweat-soldered together, especially when making the holder shown in Design A.

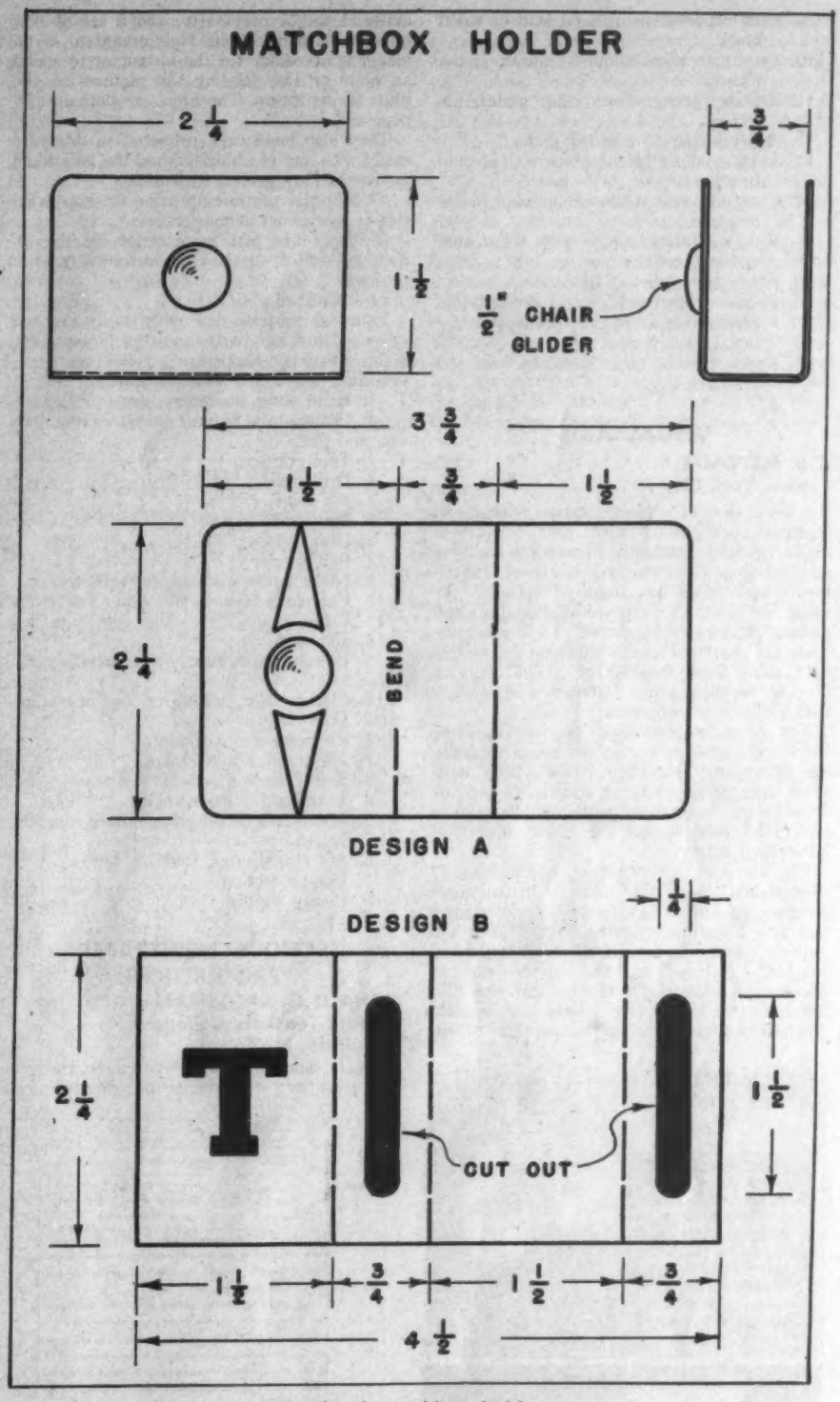
Bill of Material for Design A

No. of Pieces	*Item*	*Size*
2	Sheet tin	2½ x 4
2	Sheet tin	½ x ¾
1	Chair glider	⅛ or ¼
	Solder, flux, steel wool	

Tools: Alcohol burner, asbestos sheet, brush, carbon paper, copperplating outfit, emery cloth, file, flat iron, heating device, jeweler's frame and blade, lead or wood block, lead weight, peening hammer, pencil, rule, scriber, soldering copper, tempera water color paint — yellow, and tin snips.

Procedure

1. Use the design shown in the illustration, or develop an original one.
2. Cut out 2 pieces of tin stock.
3. Solder one side of each piece.
4. Sweat both pieces together with hot flat iron. Weight the soldered parts together immediately as more is sweated.
5. Apply coat of yellow tempera water paint to one side of sweated piece for design transfer.
6. Lay design sheet and carbon paper over painted portion and trace design.
7. Cut out matchbox holder with tin snips.
8. File and dress edges with emery cloth.



Details of matchbox holder

9. Peen exposed surfaces on lead or wood block.
10. Bend matchbox holder as shown in the illustration.
11. Remove prongs from chair glider, file edges.
12. Apply solder to edge of glider.
13. Sweat-solder glider in place with alcohol torch.
14. Cut and sweat-solder ornamental pieces in place.
15. Rub matchbox holder with steel wool and prepare for plating.
16. Apply thick coating of copper.
17. Polish project with steel wool. Hold metal with a cloth to prevent touching it with your hands.
18. Apply coat of clear metal lacquer and allow to dry.

VISUAL AIDS

L. S. METCALFE
New York City

A great deal of experimentation with visual mediums, particularly with films of various kinds, has been conducted in wartime teaching and training. The purpose of these experiments and trials has been to appraise the value and establish the place of slide films and motion pictures in education. To a great extent, the most successful experiments in this field have been those involved in applying films as supplementary instruction in various forms of school shopwork.

For years, woodworking has been perhaps the main course in our school shops throughout the country, but there has not been, until very recently, any serious attempt to provide school-shop instructors with visiual aids to cover this subject and the allied subject of basic shop safety.

To alleviate this situation, a series of 22 discussional type slide films, "Instructional Program of Safe Practices in Woodworking," has now been made available to schools and colleges. There is a total of 1128 individual teaching pictures in the series — special photographs, drawings, charts, and the like, amplified by descriptive labels and legends. Each lesson concludes with a review of the material shown previously, and a set of test questions bearing on it. Thus organized, it no longer is necessary for the instructor to spend an hour or two relating the pictures in the films to his lesson. The films are both lesson-plan and lesson.

They also have been prepared to integrate easily with any teaching method the individual instructor may prefer, such as:

a) Material pretraining prior to shop practice or workroom demonstration

b) Procedure pattern material for the individual student or the class to follow in work projects

c) Refresher material

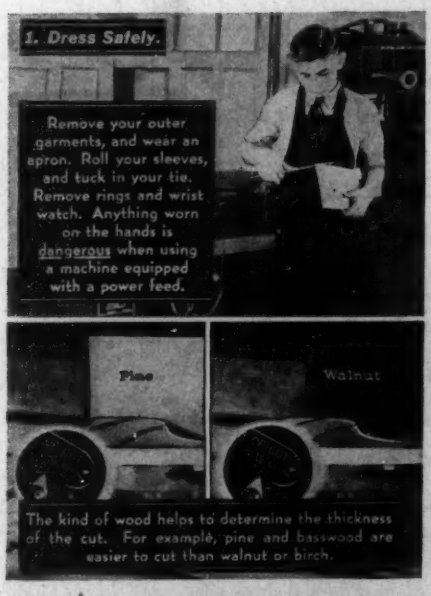
Fourteen subjects deal with the proper use of woodworking tools and machinery, and eight with basic shop safety. They are:

Woodworking Tools and Machinery:

1. Hand tools, hammers, saws
2. Planes, bits, knives, chisels, screw drivers, and files
3. Tool grinder
4. Drill press
5. Jig saw
6. Band saw
7. Disk sander
8. Belt sander
9. Lathe parts, and spindle turning
10. Faceplate turning and other operations
11. Planer
12. Jointer
13. Circular saw, parts, and installing the blade
14. Circular saw, setting up and operating

Basic Shop Safety

1. Play safe and work safely
2. Maintaining a safe shop
3. Safety inspection
4. Training for emergencies
5. Treatment for bleeding, shock, preventing infection
6. Aid for injuries, fainting, burns
7. Eye protection
8. Power supply

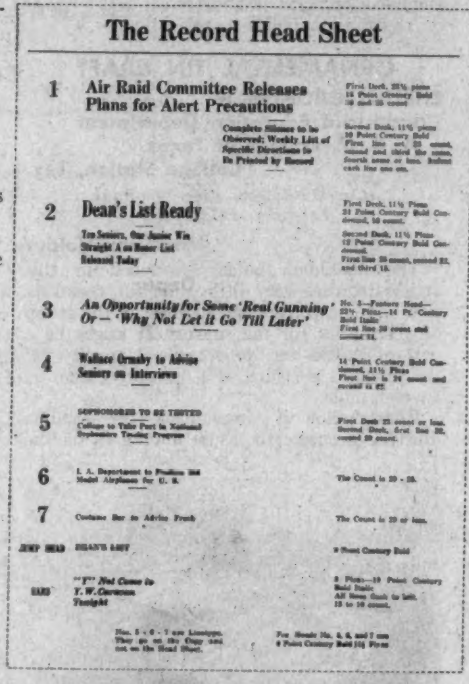

1. Dress Safely.
Remove your outer garments, and wear an apron. Roll your sleeves, and tuck in your tie. Remove rings and wrist watch. Anything worn on the hands is dangerous when using a machine equipped with a power feed.
Pine
Walnut
The kind of wood helps to determine the thickness of the cut. For example, pine and basswood are easier to cut than walnut or birch.

SCHOOL NEWSPAPER PRODUCTION

DONALD G. BROSSMAN
State Teachers College
Buffalo, N. Y.

While much has been written on the pros and cons, and advantages and disadvantages of attempting to produce a high school newspaper within the high school print shop, little ever appears in print to help the newspaper staff, the printing classes, and the newspaper's advisers who have to wrestle with this job. It is granted from the outset that there are certain objections to such a project, but it should also be recognized that there are many advantages, to the school, and far more important, to the many students who work on the editorial, art, business, and mechanical staffs.

It is the purpose of this article to give high school newspaper staffs a few suggestions as to how they may handle the problem of getting the copy and of making up the paper, rather than to sell the idea of printing a school paper in the school print shop. Let us say at the outset that the job can be done, and in


The Record Head Sheet

1 Air Raid Committee Releases Plans for Alert Precautions

Complete Silence to be Observed; Weekly List of Specific Directions to Be Printed by Record

2 Dean's List Ready

Ten Seniors, One Junior Win Straight A on Honor List Released Today

3 *An Opportunity for Some 'Real Gunning' Or — 'Why Not Let it Go Till Later'*

4 Wallace Ormsby to Advise Seniors on Interviews

5 SOPHOMORES TO BE TESTED
College to Take Part in National Sophomore Testing Program

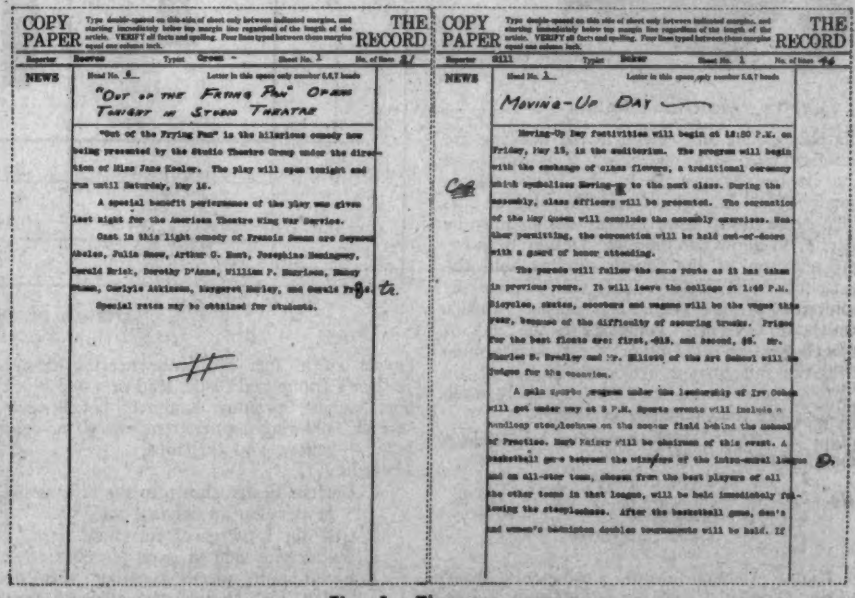
6 I. A. Department to Produce 144 Model Airplanes For U. S.

7 Costume Ser to Advise Frosh

JUMP HEAD REMAINS SAME

BAND "I" Did Come to Y. W. Ceremonies Tonight

Fig. 2. The head sheet.


COPY PAPER — THE RECORD

NEWS

"Out of the Frying Pan" Opens Tonight at Studio Theatre

"Out of the Frying Pan" is the hilarious comedy now being presented by the Studio Theatre Group under the direction of Miss Jane Keeler. The play will open tonight and run until Saturday, May 16.

A special benefit performance of the play was given last night for the American Theatre Wing War Service.

Cast in this light comedy of Francis Swann are Seymour Abeles, Julia Rose, Arthur G. Hunt, Josephine Hemingway, Gerald Brist, Dorothy D'Anna, William F. Harrison, Nancy Dixon, Carlyle Atkinson, Margaret Morley, and Gerald Fr[illegible]

Special rates may be obtained for students.

COPY PAPER — THE RECORD

NEWS

Moving-Up Day

Moving-Up Day festivities will begin at 12:30 P.M. on Friday, May 15, in the auditorium. The program will begin with the exchange of class flowers, a traditional ceremony which symbolizes Moving-Up to the next class. During the assembly, class officers will be presented. The coronation of the May Queen will conclude the assembly exercises. Weather permitting, the coronation will be held out-of-doors with a guard of honor attending.

The parade will follow the same route as it has taken in previous years. It will leave the college at 1:45 P.M. Bicycles, skates, scooters and wagons will be the vogue this year, because of the difficulty of securing trucks. Prizes for the best floats are: first, $15, and second, $5. Mr. Charles B. Bradley and Mr. Elliott of the Art School will be judges for the occasion.

A gala sports program under the leadership of Irv Cohen will get under way at 3 P.M. Sports events will include a Sunday stag,luncheon on the soccer field behind the school of Practice. Herb Feiner will be chairman of this event. A basketball game between the winners of the intra-mural league and an all-star team, chosen from the best players of all the other teams in that league, will be held immediately following the steeplechase. After the basketball game, men's and women's badminton doubles tournaments will be held. If

Fig. 1. The copy paper

such a way as to serve as an excellent teaching device rather than just one more production job.

The writer holds no brief for the school newspaper that is entirely hand set. There is little to be gained, at least from the industrial-arts viewpoint, from prolonged periods of setting type by hand, and that is the usual result in such a situation. The writer believes that the body material of the paper should be set by linotype and the heads and those advertisements that are changed frequently can be set by hand. This is a practice in common commercial use and may well be followed in the school shop. It is toward that end that the forms, described herein, have been developed.

The use of these forms will aid in systematizing the work of the school newspaper staff, will speed up the work considerably, and will ease the work in such a way as to permit greater attention to details of newspaper writing and style than to the plain mechanics of production. They may be used in almost any situation or, with little difficulty, can be adapted to any school newspaper.

Let us discuss first the copy paper. See Figure 1. This has been in use for the past three years on both high school and college levels and has been found to be entirely satisfactory. Its advantages are fourfold: (1) full instructions for the use of the paper are included in the heading; (2) margins are printed so they need not vary with the typist; (3) space is provided to letter in the head or the "slug line" which will identify it while in the galley; (4) space is provided to record the names of the reporter or editorial-writer and typist and the number of lines to be consumed by the article. By keeping the copy on file this information may serve as a basis for selecting future staff editors.

It will be noted in the heading that four lines typed between margins of the *news* copy paper equal one column inch, and that six lines typed between margins of the *editorial* copy paper equal one inch. This information printed on the copy paper will be sufficient for the editorial staff. However, the mechanical staff will want to know how to determine the margins for their own particular paper.

To determine the margins for the news copy paper obtain the average number of units in each line by counting several of the lines in the printed columns of the paper. Remember that every character or space must be counted as a unit. Let us assume the type being used has an average of 30 units per line. A typewriter having pica type types ten characters to the inch. Thus it can be readily seen that the 30 units per line will consume a three inch typewritten line. If an elite typewriter, having twelve characters to the inch, is used the 30 characters would then use a two and

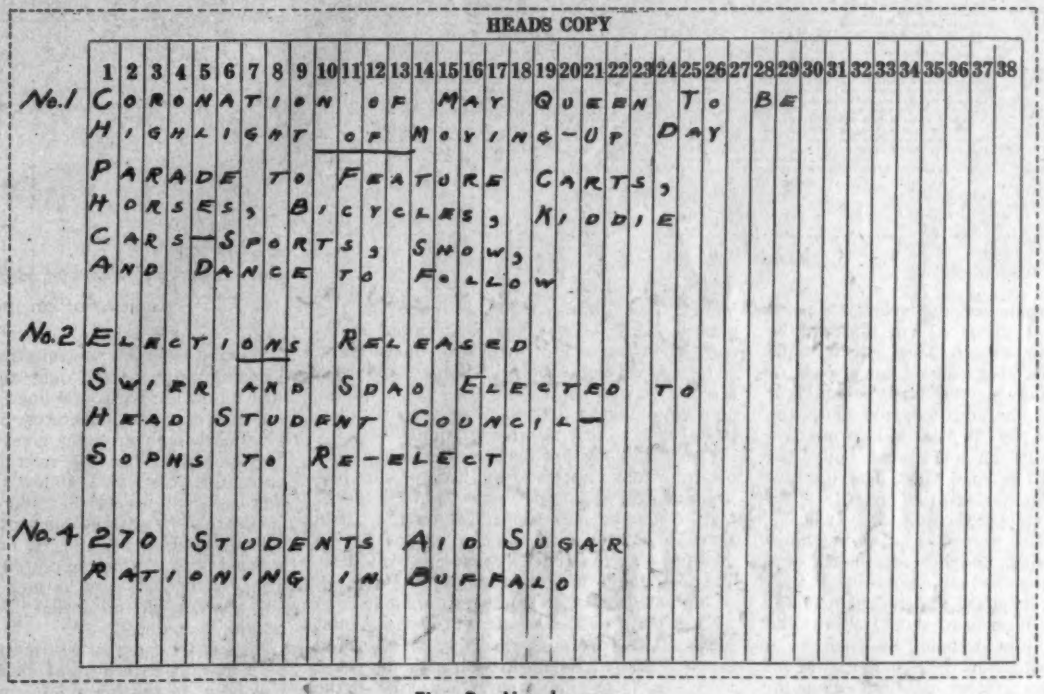

HEADS COPY
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
No.1
CORONATION OF MAY QUEEN TO BE
HIGHLIGHT OF MOVING-UP DAY
PARADE TO FEATURE CARTS,
HORSES, BICYCLES,
CARS—SPORTS, SHOWS,
AND DANCE TO FOLLOW
No.2
ELECTIONS RELEASED
SWIER AND SDAO ELECTED TO
HEAD STUDENT COUNCIL—
SOPHS TO RE-ELECT
No.4
270 STUDENTS AID SUGAR
RATIONING IN BUFFALO

Fig. 3. Heads copy

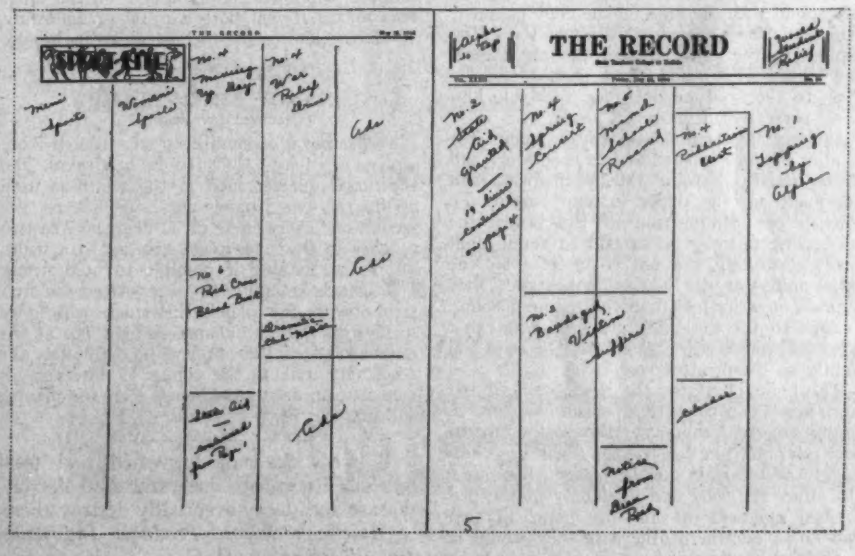


Fig. 4. Dummy sheet

a half inch typewritten line. Once the margins have been determined only the style of typewriter type used in the computation may be used, i.e., pica or elite.

The three-inch line would not be practical for use on the typewriter so the line length between the printed margins can be doubled. This means that each typewritten line will give two printed lines in the column. The usual practice in newspaper work is to use an 8-point body type cast on a 9-point linotype slug. Thus four lines of the typewritten copy will make eight lines of type which in turn would be 72 points or one column inch.

The distance between the margins of the "editorial" copy paper can be determined in the same manner. The only difference is that, since this is to be a double column, one typewritten line is equal to only one line in the printed editorial column. It is assumed, of course, that the usual double-column editorial is to be used.

The usual 8½ by 11-in. typing paper works very satisfactorily since the distance between

Alpha to Tap at Senior Ball Tonight

THE RECORD

State Teachers College at Buffalo

World Student Relief Needs Support

Vol. XXXII — Friday, April 14, 1944 — No. 21

State Aid Granted

Governor Confers with Miss Allen and Dr. Andrus on Passage of Bill

A hard-won victory was chalked up by kindergarten-primary educators last Monday, April 12, when Governor Lehman at last signed the Ehrlich Bill granting state aid to kindergartens in New York State. Passed unanimously by both houses of the State Legislature, the ten-day bill had aroused the interest of the National Association for Childhood Education which held its Golden Jubilee Convention in Buffalo last week. Pledging wholehearted support to New York State in its effort to put this bill through, the convention sent [illegible] from the Executive Board with [illegible] new grand-child, the course of the interview which lasted over three-quarters of an hour, he asked many searching questions on education.

Much credit for the State Aid to Kindergarten Bill is due Mr. Harold Ehrlich, Republican member of the legislature who has introduced the bill into the House for several years. Always interested in legislation for education and especially interested in kindergarten legislation, Mr. Ehrlich has been very friendly toward the State A. C. E. and spoke before the legislative section at the New York State Convention held at Jamestown, last fall. Mr. Ehrlich has two daughters attending the School of Practice.

(Continued on Page 4)

Two Seniors Chosen to be Spring Concert Soloists

With the Spring Concert only a week away, Friday, April 24, the Senior Women's Glee Club, the Men's Glee Club, the Band, the Orchestra, and the Junior Women's Glee Club are working feverishly to perfect the program.

From among those who competed for the coveted roles of soloists, Eugene Lapkievicz, contralto, and Earl Obermeyer, baritone, have been selected.

The following patrons and patronesses, including many prominent music lovers of Buffalo, have been invited to be present: Miss Jemamine Long, Miss Caroline Reed, Mrs. [illegible] Mr. and Mrs. [illegible] Mr. [illegible]

This part must be done [illegible] Either — gasp — you get her on your shoulders or — sigh — you don't." And there I was, being gently eased back to the floor.

"Queer," mused our instructor out loud. "Once I lifted a 205-pound man like that."

Maybe I'd better go on one of those diets Mrs. Hansen recommends.

And then there was the time I was all comfortable and happy, hoping I'd learn more about traction splinting if I actually fell down. That time I couldn't even sit up to see; they had me immobilized from the waist down. I challenge anyone to sit up with a splint plastered half-way up his side. What I learn about traction splints, therefore, is purely hearsay.

But the worst of all was [illegible]

NINE SCHOOLS RENAMED

[illegible] Become Teachers Colleges by New State Law

During the past four years a bill has been introduced into the State Legislature calling for a change in name of the normal schools to teachers colleges. These normals are located at Brockport, Fredonia, Geneseo, Cortland, Oswego, Oneonta, Plattsburg, Potsdam, and New Paltz.

Up to this time there were only 17 normal schools left in the United States, nine of which were in New York State. Most of the other normal schools in the United States had been changed to teachers colleges, and, also envisioned, [illegible] something else I want to [illegible] there yet!" And more subtly, just for me, "Let your head fall forward everytime I put it in place," which I did obediently. For the next couple of minutes my head was slapped into position on every forward move. Finally satisfied with that, she started to bounce my hips around to get a limber under me.

And the next day I was as battered and bruised and my knees were as stiff that I couldn't go up or down stairs.

Such is the life of a neophyte First Aider.

NOTICE—

Many calls are in for students to serve as counselors in summer camps. Those ranges from service for the sake of experience to salaried jobs. Ask for details at Miss Catherine Allen's office, if you would like this opportunity for a summer's outing and a professional recommendation.

Tapping by Alpha to Highlight Silver Ball Tonight

Publications Elect Early; 1943-44 Heads Released

Election of editors for the 1943 publications staffs held early this year to facilitate an advanced organization and a longer period of planning, was conducted [illegible] Monday evening by [illegible] Faculty Publications [illegible] After completion [illegible] to nothing directors, and [illegible] of committees. Announcement of these associate staffs will be made at the Publications Banquet to be held early in May.

CALENDAR

Friday, April 14—
4:15—Community Club, Social Center B
4:45—Student Council, 116
5:00—T. T. A., 10
5:45—The Lambda, Social Center A
10:0—Senior Ball, Kleinhans
Saturday, April 15—
4:15—French Club, 104
4:45—Social Club, Social Center A
6:0—Women's Forum, Gym
7:30—W. S. G. A., Social Center A
Wednesday, April 19—
4:15—W. S. A., Social Center B
4:30—Chorus, Orchestra and Mr. Lincoln Mayo, Social Center A and Faculty Dining Room
6:0—Dramatic Club, Social Center A
Thursday, April 20—
4:45—Men Club Rehearsal, Social Center B

Traditional Senior Ball to be Held at Kleinhans Hall; Bob Armstrong and NBC Orchestra to Play

Dim lights, flowing [illegible] and soft music [illegible] will be the [illegible] in [illegible] when the Senior Class presents its annual Silver Ball in Kleinhans Ballroom on Friday evening, April 14, from 10 to 1 o'clock.

Chairs Sieger with Helen Bolton whose choice is red chiffon. A flowered chintz gown will adorn Lois Johnston whose escort will be John Bourne. Navy Holmes and Peggy Hammond will be a two-some. Walter McVee will be with Mary McPartlin in black net. Tom Williams will escort Jane North in red jersey. Richard Kreline with Ruth Blocker in blue jersey and white organdy will also be present.

Others who will be at the Ball are Shirley Adams in champagne taffeta with Duane Purdy; Kathleen Link with Robert Martin; Doris Hick with Roland Murphy; Madeline Yeaks in white chiffon with Carlton Gerbracht; Martha Yeager in lace and marquisette with Bill Glasgow; Rita De Meo in blue taffeta with Patrick Pinto; Hunter Topps in aqua velvet and taffeta with Carl Pundt; Vera Heck and Herbert Hilton; Gertrude Berlin in eggshell net with David Levinson; Dorothy Nichols in pink chiffon with Myron Wishnant.

Jean and Betty Klotz are the lucky winners of the ticket to the Ball offered for the best poster illustrating the theme of the dance.

Fig. 5. Ready for delivery

the printed margins for the average 8-point type set in an 11½ or 12 em line will be approximately six inches. This leaves ample margins in which copyreader's corrections or special instructions to the linotype operator can be written. The editorial column of the paper supervised by the writer is printed in 10-point type cast on a 12-point body, the column being 23½ ems wide. The distance between the margins for the average type of this size will be approximately 5¼ inches.

Next comes the printed *head sheet* shown in Figure 2, which should aid both the editorial and mechanical staffs immeasurably. Placing such a head sheet before the student not only shows him how each head should appear but explains exactly how it should be counted out by the heads writer and then composed in the print shop. The system of numbering the heads according to the importance of the article is adapted from commercial newspaper practice and facilitates designating the proper head for an article.

The actual style of heads and the head schedule to be used can be worked out by the staff of any paper. Again by counting several heads, and taking an average the desired count can be obtained. This count is the number of units which will fill the line to the desired length. This should be done for each head in the schedule.

While many systems of counting the units are in use, the one shown in Figure 3, has been found to work reasonably well, and is considerably easier and shorter than most of the other methods. In this method the *heads copy* sheet used is ruled vertically and the spaces numbered so that the greatest number of units in any head in the heads schedule can be accommodated. To write the head it is necessary only to insert one letter, punctuation mark, or space between words in each of the numbered spaces until the desired number of units for the particular head has been obtained. This number will be found on the printed *head sheet*. Using the printed heads copy sheets saves a great deal of unnecessary counting. Students using the heads copy sheet usually draw a short line after the required number of units and then write until they have filled in that number of units.

Once the copy has been written and typed onto the copy paper and the head or slug line lettered into the proper space, it is a simple matter for the make-up editor on the paper to count up the total number of lines to be consumed by the article. From the head sheet the amount of space needed for the head can be obtained. This added to the amount used by the body of the article will give its total length. This can be marked out on a printed dummy printed especially for make-up work (See Fig. 4) or simply on an old issue of the paper. The slug line and the number of the article should be written on the dummy to correspond with the ones on the copy paper.

In actual use, copies of all forms should be familiar to the editorial staff and mechanical staff alike. The heads sheet should also be given to the linotype operator to enable him to set correctly all linotyped heads.

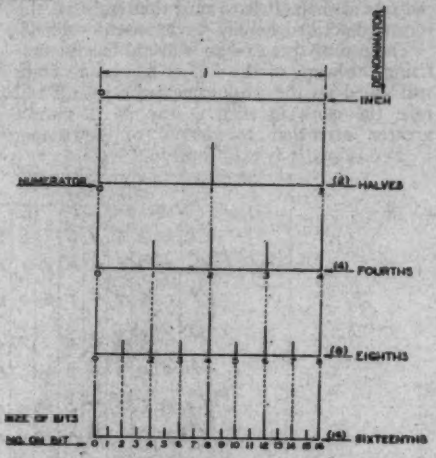
As long as the make-up editor counts the number of lines in each article accurately and places them carefully the mechanical staff can make up the paper in short order. To quicken the composition of the heads, the heads writers must be careful to count their heads accurately and not to insert even one extra unit. For the sake of appearance they should not write less than the required count. Failure to fill the lines properly will cause *lakes* of white space that may become unsightly on the printed page.

The main point for the newspaper adviser to remember in using these or similar forms is to prepare the forms accurately so they fit the particular newspapers, explain their use thoroughly to all staff members, and then insist that they are used and used only in the prescribed manner. In this way hours of time can be saved where otherwise they would be consumed needlessly.

FRACTIONS OF AN INCH

J. R. HANKISON
Junior High School
Logan, Ohio

Most try squares, squares, rulers, etc., in the industrial-arts laboratory are graduated or divided into eighths or sixteenths of an inch. Notice that the divisions start with 0 and you have not measured any distance until you reach the first graduated line. This distance may be 1 in., ½ in., ¼ in., ⅛ in., or 1/16 in., depending on how the ruler is graduated.



Fractions of an inch

To find 5/8 in. on the ruler first look at the denominator, 8, on the right of the chart and then follow the horizontal line to the left until you arrive at the numerator, 5, in this case. This mark on your ruler gives you 5/8 of an inch from 0. When the ruler is divided into sixteenths of an inch, follow the same steps just described except that you follow the denominator line marked sixteenths. A denominator consisting of an even number may be reduced by following the dotted line to its top. Thus 6/16 equal 3/8 of an inch while 7/16, an odd number, has no dotted line above it and cannot be reduced.

This chart can also be used to find the size of a hole in sixteenths of an inch that a bit will bore. In the lower left corner notice the arrow pointing to the number on the bit. For example, a bit has the number 6 on the tang. This means it will bore a 6/16, or following the dotted line to the top, 3/8 of an inch hole.

HANDY BENCH CLAMP

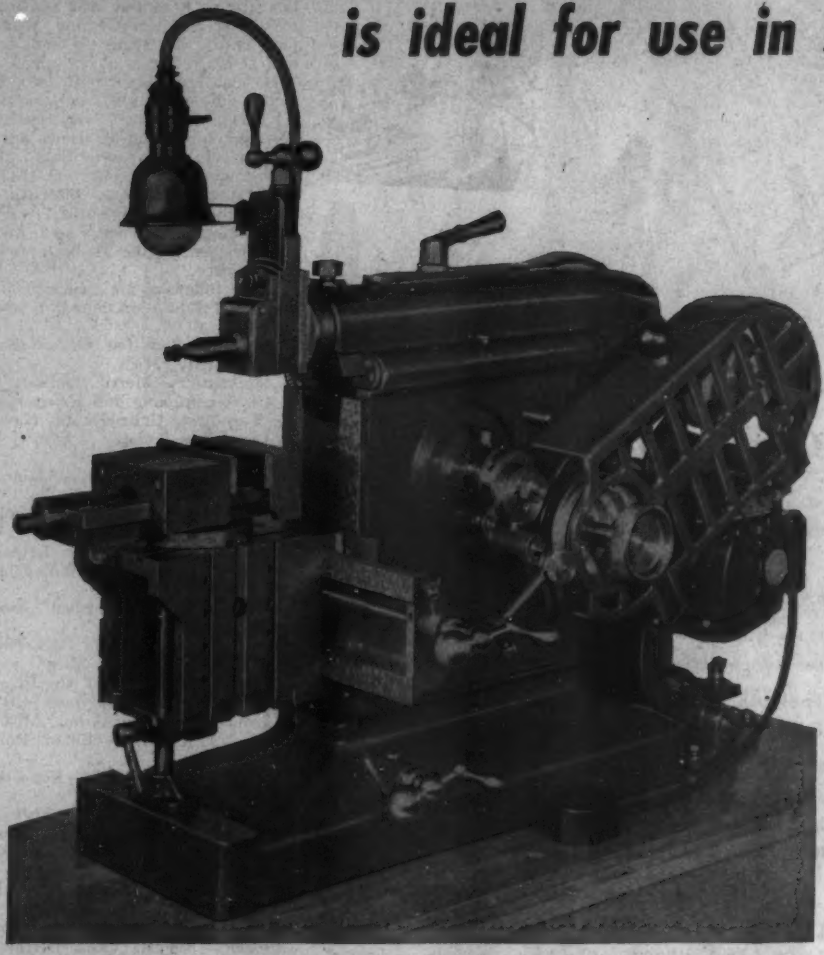
(Continued from page 178)

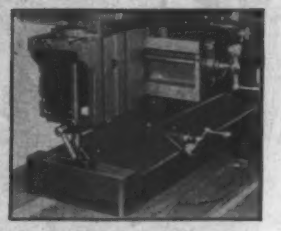
The clamp is economically constructed from a piece of 5/8 by 6¾ by 10-in. hardwood. The additional quarter inch in the width is used up by the two ripping cuts, one square, the second one at an angle of 30 degrees. The two notches in the centerpiece are cut to a width of 5/8 in., making it possible to hold firmly 1-in. stock standing on edge. After the first stroke with the plane, the stock will lodge itself firmly in the clamp. A light tap at the narrow end of the notched piece loosens the stock. By making the clamp 5/8 in. thick, it can also be used as a bench stop for planing the surfaces of 1-in. stock.

If trees are not harvested and used when their growth rate starts to decline, disease and decay eventually destroy them. —*American Forest Products Industries, Inc., Washington, D. C.*

AMMCO 7" PRECISION SHAPER

is ideal for use in school shop!





★ Has "VEE" Type Ways, comparable to those of large, expensive shapers.

★ Handles a wide variety of work.

★ Portable Model is mounted on maple cabinet.

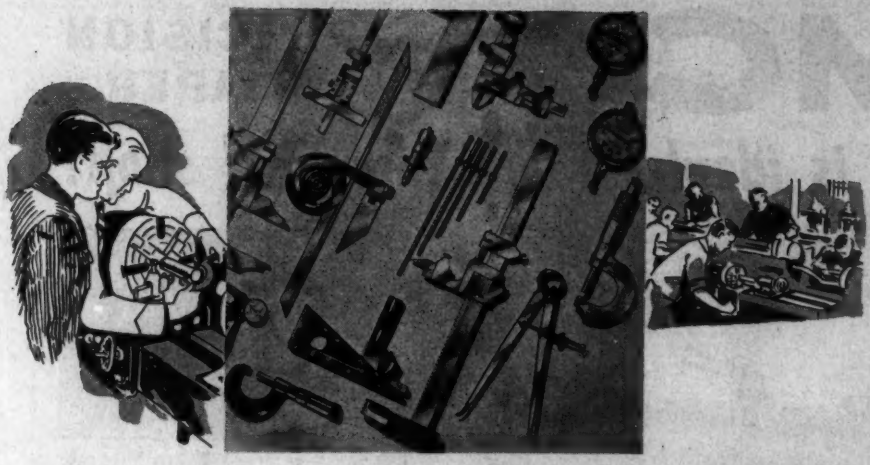
Students quickly acquire ability to produce accurate work on this precision machine

Leaders in school shop instruction unreservedly recommend the AMMCO 7" PRECISION SHAPER. It is small in size, but it is mighty in efficiency and precision... It incorporates all important features of larger machines selling for hundreds of dollars more than the Ammco . . . and users of the Ammco tell us "it's the finest made". . . . Simplicity of operation, plus special safety features, make this machine ideal for student use. A wide variety of work can be done on this shaper, and as one instructor has said —"it is a precision machine of a thousand uses."

Made for bench installation, or as a portable unit.

Write today for specifications and prices

AMMCO 2100 COMMONWEALTH AVENUE NORTH CHICAGO, ILLINOIS



When You Start 'Em With STARRETTS *They Stick To* STARRETTS

You'll find that your students of yesterday still prefer the fine precision tools you taught them to use and appreciate—Starrett Tools.

Here's why:

First, they have come to know, through experience, that your conseling them to use fine tools was sound advice.

Second, the Starrett Tools they learned to like and trust are still made to the same high standards of quality and precision they have come to count on.

You may continue to tell your students to start with and stick to Starrett Tools, for the Starrett Tools of tomorrow will continue to be worthy of their skill.

Now, with 3 Service Stars

THE L. S. STARRETT CO., ATHOL, MASSACHUSETTS, U.S.A.

World's Greatest Toolmakers

STARRETT TOOLS

Personal News

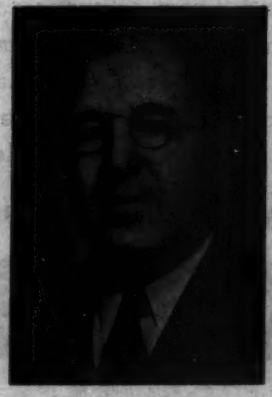
EDDIE CHERRY PASSES ON

Eddie Cherry, the dean of commercial travelers in the school shop field, has come to the end of his long and helpful career. Known to thousands of executives, supervisors, and teachers in the fields of industrial arts and vocational education, he will be missed by many.

He was born in what is now known as the Greenwich Village section of New York City on September 4, 1874. Starting as an office boy at the old Stanley Rule and Level Company on September 15, 1889 in New York, he was advanced from one position to another until he was appointed as one of the two national representatives of the present-day firm known as Stanley Works.

Mr. Cherry served in the U. S. Navy during the Spanish American War and took part in the battle of Santiago. During World War I he represented the Stanley Company in Washington, D. C.

He died on February 10, 1945. He is survived by his wife, three sons, and two daughters.



Eddie Cherry

♦ CHAS. A. KUNOU, who retired after having been the supervisor of elementary school industrial arts at Los Angeles, Calif., for many years, passed away on October 26, 1943.

♦ MAURICE PANCOST, principal of Technical High School, Lansing, Mich., was elected to fill the vacancy left when Floyd Allen resigned as vice-president of the Michigan Industrial Education Society.

♦ The following are chairmen of the Michigan Industrial Education Society's research committee:

Adult and Part-time Education—Edwin Melin, Traverse City, Mich.

Aeronautics—Merril Hamburg, Detroit, Mich.

Air Conditioning and Refrigeration—Lt. Carl H. Turnquist, United States Navy, Miami, Fla.

Apprentice Training—John J. Harris, Lansing, Mich.

Automobile Mechanics—Albion S. Taylor, Monroe, Mich.

Bench Metal—Harvey Smith, Dearborn, Mich.

Drafting—F. R. Kepler, Detroit, Mich.

Electricity—George Willoughby, Ypsilanti, Mich.

Machine Shop—Stephen Vanek, Dearborn, Mich.

Patternmaking and Woodworking—Floyd Bennet, Grand Rapids, Mich.

Printing—J. Herbert Cigard, Lansing, Mich.

Projects and Improvised Shop Equipment—Marshall Byrn, Ann Arbor, Mich.

Visual Education—Eldon Robbins, Lansing, Mich.

Related Trade Work—Kenneth Jackson, Detroit, Mich.

Room Layout and Equipment—Claire Floutz, Battle Creek, Mich.

School Shop Safety—Carl E. Karlstrom, Detroit, Mich.

Teaching Methods and Aids—Ira C. Madden, Detroit, Mich.

Trade and Industrial Education for Girls and Women—Augusta Ochs, Detroit, Mich.

Vocational Technical Education—William Stirton, Detroit, Mich.

Welding—Kenneth Willoughby, Lansing, Mich.

Association News

♦ The officers for the National Graphic Arts Education Association for 1944-45 are:

President, Hupp E. Otto, McKinley Vocational High School, Wheeling, W. Va.;

Vice-President, Michael J. Eck, Edison Occupational School, Cleveland, Ohio;

Secretary, C. S. Romig, Altoona Senior High School, Altoona, Pa.;

Treasurer, Vincent Coyne, Middlesex County Vocational School, New Brunswick, N. J.;

Educational Director, Fred J. Hartman, 412 National Savings and Trust Building, 719 Fifteenth St. N.W., Washington 5, D. C.

♦ The officers elected by the Wisconsin Industrial Arts Association for 1944-45 are:

President, Karl Ludeman, Waukesha, Wis.;

Vice-president, W. E. Jersey, Whitefish Bay, Wis.;

Secretary-treasurer, H. J. Shufelt, Racine, Wis.;

Committeeman-at-large, O. Paciotti, Beaver Dam, Wis.

(Continued on page 22A)

.0005"

Fine accuracies can be secured only through the use of machines built to maintain exacting specifications.

PRECISION IS OUR BUSINESS

For over 57 years Sebastian has built lathes exclusively

"Best Lathe In The Medium Price Field"

Train your students on the lathe they'll use when they graduate into the business.

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If it's a small part

. . . turn it with Precision, Speed and Profit

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LATHE

Model S-56
10" Precision Lathe

Engineered for precision shop and tool room work. Rigidly built to stand up and hold its close accuracy under round-the-clock operation. This is a quality machine tool in every detail, yet is moderate in price . . . a lathe that stands out far ahead of others. The lathe selected by U. S. Army, the Navy and the Marine Corps. for mechanized machine shop instrument repair shops, etc.

Contact us or your local Sheldon dealer for prices, engineering data, deliveries, etc.

- Bronze or anti-friction bearings
- 1" Collett capacity
- 11¼-inch swing
- Double-walled apron
- Large hardened and ground spindle
- Extreme accuracy
- Convenient controls
- Underneath V-belt motor drive
- All Steel Bench

All SHELDON lead screws are cut on the finest Pratt & Whitney "Super-precision" lead screw machine.

BUILDERS of GOOD LATHES since 1919

SHELDON MACHINE CO., INC., 4244 N. Knox Ave., Chicago 41, U.S.A.

(Continued from page 20A)

♦ The annual conference at the New Jersey State Teacher's College, Newark, N. J., was held on Saturday, February 10, 1945, at 10 a.m.

During the morning session a panel composed of ten administrators, some of whom had risen from the ranks of industrial-arts teachers, occupied the stage. These educators answered questions and expressed their views on the field of industrial arts in general.

Notes Gathered at this Panel Section

After World War I education gained a great deal. After this war there will be, no doubt, another great impetus given to education.

Because of the great need, no complaints are heard about the cost of education in military services. Army teaching has been very effective. The army instructors make use of all five senses, and classes are kept down in size.

There is a lack of mutual understanding on the part of administrators as to the function of industrial arts. Slow learners are dumped into shop classes and high IQ's are kept to bolster up the academic field.

Courses in industrial arts should be set up for administrators so that they would know something of the concept of industrial-arts education. There is a book on *Reading* for administrators; why not one on industrial arts?

Industrial arts is a vocational course in some schools. More co-ordinators between business and education are needed. The public seems quite willing to advance money for instruction and training to kill people. Why not put in the same amount of money to train them to live and let live?

Shortages of industrial-arts teachers are forecast for the next ten years.

Work experience is a tremendous factor in the life of a student.

Mr. John A. McCarthy, assistant commissioner of education, stated that industrial arts started in New Jersey in 1888, and was called "Manual Training." This is still the official legal name, although it is not in common use. The matching program of $5000, originated then, has not changed.

A job preparatory program started in several communities developed into vocational education.

Students use subjects that carry the most credits toward a diploma, with less regard for worth of programs of lower credit value.

We are faced with a changing future. This is a period of social change. There is the "swing shift," woman in industry, and the induction of fathers to break up the home. There is the problem of living, inflated wages, and marriages resulting from the glamour of a uniform.

There are dangers ahead in the methods of mass production. Jobs have been simplified. Whole sections of industry have moved out.

Mr. Robert A. Campbell followed on the program. He stated that out of the shortages of material, we are getting a finer kind of industrial arts. A "Home Maintenance" shop has been created in one school. Shops should be planned to get away from merely woodwork. The boy who knows how to bore a hole in wood should also know how to drill one in metal.

Ten industrial-arts supervisors comprised the panel for the afternoon session.

The consensus of opinion was that every boy and girl in shop or kitchen should be taught to create, measure values, and get along with others. Student schedules are not thought out as carefully as they should be. Secondary schools are still set up too much on the idea that all students will go to college.

No salary increase credits are given teachers for actual industrial experience. An A.B. degree does not necessarily make a good shop teacher. A general shop teacher needs a wider background than one assigned to a unit shop. — *G. Harold Billingham.*

♦ During the week of January 14 members of the state staff and supervisors of local day-trade programs attended a three-day subregional trade and industrial conference held at Kansas City, Mo. The conference was conducted by N. B. Giles, Central Regional Agent, Trade and Industrial Education, U. S. Office of Education. Members of the staffs from Arkansas, Kentucky, Missouri, Oklahoma, and Minnesota were also in attendance.

♦ The annual meeting of the School Crafts Club, New York City, was held on Saturday, January 20, 1945.

L. Omer Asher, president of the New Jersey Vocational and Arts Association, gave a report of the industrial-arts sessions held at the American Vocational Association convention at Philadelphia.

Charles Kacsur who teaches in one of the New York junior high schools, gave an interesting talk on his hobby of collecting, polishing, and mounting gems and jewels. He also exhibited his personal fine collection of gems and jewels collected locally and in many parts of the world.

The officers for the coming year are:

President, Philip M. Wagner, Newark, N. J.;

Vice-President, Loring J. Barker, West Orange, N. J.;

Secretary, Ralph Carter, South Orange, N. J.;

Treasurer, Charles G. Fischer, Brooklyn, N. Y.

♦ The Related Arts Service is an organization located at 511 Fifth Ave., New York City, the objectives of which is to raise the standard of art training by means of an improved public understanding of art, and to increase the support of art education.

The organization held its sixth annual meeting at the Commodore Hotel, New York City, last October.

In his annual report, the secretary stated that the organization had mailed four bulletins on art to a list of over thirty thousand educators including superintendents of schools, art directors, art teachers, and parent-teacher associations. Each bulletin was prepared by an outstanding art authority and was designed to assist the art teacher in the organization of her program. The theme of the bulletins this year and last was "Crafts," because of the importance of the crafts at this time in the rehabilitation of servicemen and in juvenile delinquency programs.

The secretary's report was followed by a discussion by prominent educators in the art field.

(Continued on page 26A)

A lesson that can be easily proved with Disston Tools

Manual training instructors frequently emphasize the fact that students are more interested in their work and progress faster when cutting tools are sharp and true . . . one reason why Disston Tools are so frequently preferred for school workshop use.

The tough, wear-resisting quality of Disston Steel, plus expert workmanship, give Disston Tools the extra sturdiness needed to withstand the rough usage of beginners term after term. This is of special importance during these days of tool scarcity.

Government requirements are still absorbing the greater part of Disston production. But with care the Disston Tools you now have will serve you well until more can be made available. However, if your students are training for essential work, and you need additional Disston Tools, your local hardware retailer may be able to help you.

Hardware retailers will also be glad to supply your students with FREE copies of the Disston Saw, Tool and File Manual. Educational charts and other useful material, for your own use, will be sent to you without charge. Write to us direct.

HENRY DISSTON & SONS, INC., 438 Tacony, Philadelphia 35, Pa., U. S. A.

APPRENTICESHIP
. . . the American Way

More and more the Vocational Classroom is replacing the apprentice bench for skilled American labor.

It's important, therefore, that your pupils get *practical* training . . . that the tools, materials and methods with which they become *familiar* in their training will be applicable in their work.

When you use Weldwood Glue in your classroom, you can be certain that your students are getting experience that will be of *practical advantage* on the job they'll do tomorrow.

Every woodworker likes this modern plastic glue. It's cold-mixing . . . cold-spreading . . . cold-setting.

In fine powder form, Weldwood Glue mixes readily with ordinary tap-water to form a smooth, easily spread, tremendously strong bonding agent.

Stain-free and odorless, it sets so fast that jobs can be handled a few hours after clamping.

These are classroom advantages, too.

Available in 1⅛ oz., 3½ oz., 8 oz., 1 lb. and 5 lb. cans at hardware stores and lumber yards and 10 lb. and 25 lb. cans and 100 lb. drums from your supply dealer.

For full information, literature and sample, mail the coupon below.

"Makes the Glue Line the SAFETY Line"

WELDWOOD
PLASTIC RESIN
WATERPROOF GLUE

UNITED STATES PLYWOOD CORPORATION
Industrial Adhesives Division, Dept. 181
55 West 44th Street, New York 18, N.Y.

Please send literature, sample and prices on Weldwood Glue:—

*Name*_____ *Position*_____

*School*_____

*Address*_____

*My Regular Source of Supply is*_____

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"MACHINE-OF-THE-MONTH"

No. 9 MORTISER

Direct-drive 3600 r.p.m. motor. Precision key chuck—½" capacity. Bushings available for chisels and bits up to 1" square. Positive accuracy and alignment insured with table and motor operating on same ways. Boring attachment extra.

For clean, accurate mortising work we're proud to put the Wallace nameplate on the No. 9 model!

Here's a ruggedly-built mortiser made to precision specifications — a heavy-duty machine that has met the requirements of hundreds of industrial shops. It's a *practical* machine — for practical trade courses.

Write today for bulletins — we also make high-grade Universal Saws, Cut-Off Saws, Bandsaws, Jointers, Shapers, Lathes, Oilstone Grinders, etc.

J. D. WALLACE & COMPANY
140 S. CALIFORNIA AVE. CHICAGO, ILL.

Just Published

A BOOK THAT SOLD ITSELF MONTHS AGO!

Remember the Surprise "Hit" Lecture of the A. V. A. Convention in Philadelphia — Ray Perry's Talk on

Blackboard Illustration?

More than 200 men jammed themselves into a small hotel council room to hear a preview of Perry's book — still in manuscript form at that time. Now this sharp, strong analysis of the oldest, least appreciated "visual aid" of all is ready for distribution. Written and illustrated specifically to cover problems of the industrial-arts teacher!

BLACKBOARD ILLUSTRATION

By Raymond W. Perry, Teacher Trainer and Supervisor of Industrial Education, Rhode Island

How to get the most out of blackboard demonstration, covering (1) the Shop Talk, (2) Equipment and Methods, (3) the Diagram, (4) Pictorial Drawing, (5) Building Perspective Drawings, (6) Diagonals, (7) Lettering, (8) the Exploded Drawing, (9) Sectional Perspectives, (10) Drawing and Talking, (11) Floor Plans, (12) Directional Maps, (13) Developments and Patterns, (14) Plotting Irregular Shapes, (15) Tests.

26 illustrations. Every point set up for instant reference, in clear, logical order.

Here's a book you'll wear out with use! Order an "on-approval" copy today!

Clothbound, $1.50

THE MANUAL ARTS PRESS, Peoria 3, Illinois

News Notes

♦ J. Henry Holloway, principal of The New York School of Printing, New York City, is asking of the city of New York through the board of education for a new building with site and equipment to cost four and one-half million dollars not including the proposed technical institute for which an additional one million six hundred thousand dollars will be needed. This building is to be located near the present school.

In the request which goes to the board of education, special mention is made of acoustics, elevator service, clothing lockers, the communication system from principal's office to individual or all classrooms and shops. In large rooms floors are to be slanting. These are just a few items of the many that are to be included in the new school.

♦ The Princeton Film Center, Princeton, N. J., motion picture producers and distributors, has just released its 1945 film catalog, listing a wide variety of educational and special purpose films.

In the comprehensive educational section, films designed especially for classroom use are available for teaching aids in history, geography, chemistry, physics and social studies, as well as health, safety, and other general topics.

♦ To help American industry bridge immediate dislocations after V-E Day, nearly 200 of the outstanding postwar trade potentialities, new products, and services have just been summarized in "Transition Opportunities."

"Transition Opportunities" was prepared from data secured through key industrialists, government and trade association officials. Copies may be had at 25 cents each from the N. Y. Journal of Commerce, 63 Park Row, New York 15, N. Y.

♦ A follow-up survey made in New York City among trade school graduates for five semesters, ending June, 1943, showed that during that interval approximately 66 per cent entered employment for which their school preparation had specifically prepared them.

The survey did not include the 1944 graduates because most of them had entered the armed forces.

♦ Plans for a postwar vocational education building are in preparation at Winfield, Kans., by Supt. Evan E. Evans and members of the high school faculty. Equipment needed for the different types of programs also are being listed.

♦ Supt. C. E. St. John and his staff, Arkansas City, Kans., are looking forward to an expanded vocational education program following the war. A tract of land adjoining the high school and junior college has been purchased as a building site. Plans for a building and for equipment are under way.

♦ The James F. Lincoln Arc Welding Foundation, Cleveland, Ohio has just announced a project in the form of an award program to encourage the preparation and publication of textbooks, one on machine design and another on structural design covering all processes used in fabrication, including welding.

This new project, known as "The $20,000 Award Program for Textbooks Covering Machine and Structural Design for Modern Processes," is made eligible to any person in the teaching profession, in industry, or engaged in private consultation. A manuscript may be submitted jointly by two or more persons. No one person can participate in the writing of more than one manuscript in each class — machine design and structural design.

The awards in the program are divided into two classes: Class A, Machine Design; and Class B, Structural Design. There are three awards in each class as follows:

Class A — Machine Design	*Class B — Structural Design*
First award, $5,000	First award, $5,000
Second award, $3,000	Second award, $3,000
Third award, $2,000	Third award, $2,000

Papers will be judged by a Jury of Award drawn from appropriate branches and institutions of engineering education. Selection of the jury will be under the direction of the Chairman of the Jury of Award, Doctor E. E. Dreese, Ohio State University, Columbus, Ohio.

The subject matter of the manuscripts is to be suitable for collegiate engineering textbooks in Machine Design and Structural Design, with the objective of producing the most modern textbooks in these fields. Fabrication methods, including welding, are to be treated as elements in design practice so as to provide a well-balanced treatment.

Further details of this new Award Program for textbooks, which closes May 15, 1946, may be obtained by addressing the Secretary, The James F. Lincoln Arc Welding Foundation, Cleveland 1, Ohio.

♦ The War Manpower Commission has issued a brief, simply expressed pamphlet entitled, "Looking Ahead by Way of Apprenticeship." This pamphlet is designed especially for distribution to youths who want to know what the work is like in a skilled trade, how to develop their abilities along the lines for which they are best fitted, and the training opportunities open to them.

Apprentice training today includes both classroom instruction and training on the job. High school graduates are preferred. Apprentices earn while they learn. As they advance in their skills, their wages increase automatically. Upon completion of their training, they are promoted to the status of journeymen and awarded a certificate of completion of apprenticeship which corresponds with the diploma awarded graduates of schools and universities.

Copies of this pamphlet may be obtained by writing to Apprentice-Training Service, Bureau of Training, War Manpower Commission, Washington 25, D. C.

♦ Ideal Pictures Corp., 28 East 8th St., Chicago 5, Ill., announces that it has on hand a number of good used 16mm. projectors which can be obtained without priority.

Filing Hints To Meet Your Needs

Right Way to Hold a File

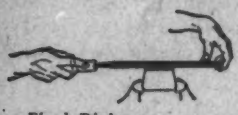

Fig. 1. Right way to hold a file with both hands.

Fig. 2. Correct grip for removing stock rapidly.

Fig. 3. Correct grip for flat filing.

Fig. 4. Correct grip for precision work.

Hold the handle of the file with the right* hand, and the tip of the file with the left hand. Although the position of the left hand varies with the job to be done, the right-hand grip remains the same. See Fig. 1. The beginner should let the file handle rest in the palm of the right hand, with the thumb lying along the top of the handle and the fingers curling around the handle and falling into a natural grip.

When the tip of the file is gripped with the left hand, as shown in Fig. 2, with the ball of the thumb pressing upon the top of the file and lying in line with the file axis, and with the fingers winding around the file, a powerful grip is secured. When a lighter stroke is wanted, the direction of the left thumb is changed more and more until it lies at right angles, or nearly so, with the length of the file. The tip of the file is then held between just the thumb and the first two fingers of the left hand.

Fig. 3 shows the correct method of holding the file for flat filing. Fig. 4 shows the correct method of holding the file for very accurate work, or when curved surfaces are to be filed. The grip shown allows maximum guidance and control.

Awarded to the Newcomerstown, Ohio, Plant

HELLER BROTHERS COMPANY
America's Oldest File Manufacturers
Good Tools Since 1836
Newark, N. J., Newcomerstown, Ohio

*The directions given are for a right-handed person. By reversing the file positions, they will apply as well for a left-handed person.

HELLER NUCUT FILES
WAVY TEETH

Teach Fine Craftsmanship with the

IMPROVED

STANLEY ROUTER-SHAPER

The improved-design Stanley Router-Shaper, more than any tool in the shop, helps you teach fine, finished craftsmanship. It gives that added touch to make the project attractive and performs countless woodworking operations directly and easily. Its high speed – 18,000 R.P.M. – produces smooth work, making sanding practically unnecessary.

Note its up-to-the-minute features – recessed switch to prevent turning on when motor is laid down – switch separately housed and readily accessible for replacement – push-button shaft lock for changing bits or cutters – chuck removable for converting to spindle shaper – brush caps protected – plugs in anywhere ready for work. *All these features at a new low price!*

NEW LOW PRICE
PUSH BUTTON SHAFT LOCK
Switch Accessible and Replaceable
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MAIL THIS COUPON TODAY

STANLEY ELECTRIC TOOLS, Educational Dept.
New Britain, Connecticut 1A–445
GENTLEMEN: Please send free booklet describing the Stanley Router-Shaper.
Name.....
Subject You Teach.....
School Name.....
City and State.....

(Continued from page 22A)

Among the topics proposed for the 1945 bulletins were "Art on the Home Front," "Intercultural Relations with Other Countries," "The Use of Museums by the Art Teacher," and a list of tested art aids for art teachers.

New Publications

Ben Hunt's Whittling Book

By W. Ben. Hunt. Cloth, 127 pages, 6⅞ by 10¾ in., illustrated. Price, $2.50. The Bruce Publishing Company, 540 North Milwaukee St., Milwaukee 1, Wis.

The 2nd edition of this delightful whittling book has been enlarged by several new and interesting projects.

As a hobby, the whittling of worth-while projects stands without peer. The author's easily followed directions encourage the beginner, and the beauty of the finished pieces cheer the whittler on to attempt the more advanced things shown in the book.

Auto-Mechanics — Course 4

By Ray F. Kuns. Paper cover, 302 pages, 5¼ by 7½ in., illustrated. School price, $1. The Bruce Publishing Company, 540 North Milwaukee St., Milwaukee 1, Wis.

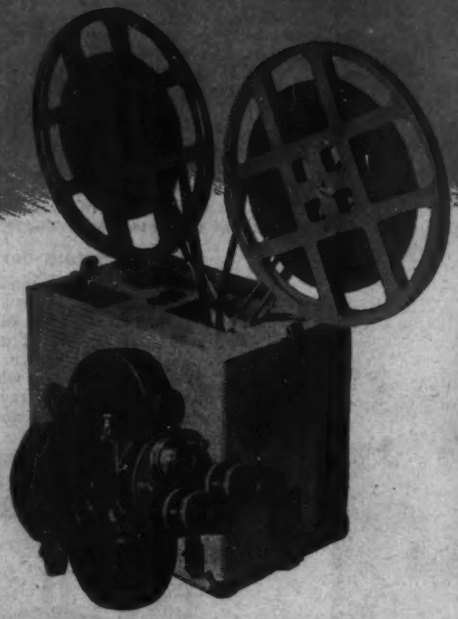
The fourth book in the series of texts developed by the U. S. Armed Forces Institute treats of the power flow in the automobile engine.

The material covered includes friction clutches, transmissions, the various drives, universals, rear axles, four-wheel drives, automobile frames, and the different types of car suspension.

The book covers ten units, each of which con-

(Continued on page 28A)

Persons shown on banquet picture, are: 1. W. J. Calhoun, American Crayon Co., New York City; 2. A. B. Maloney, American Crayon Co.; 3. Reginald Baker, New Rochelle, N. Y. Schools; 4. Charles Scott, American Crayon Co., New York City; 5. C. W. Knouff, American Crayon Co., Sandusky, Ohio; 6. J. E. DeMeyer, The Related Arts Service; 7. M. Lester, Art Crayon Co., Brooklyn, N. Y.; 8. Bert Cholet, Higgins Ink Co., Inc., Brooklyn, N. Y.; 9. E. Daggett, supervisor of art, Kearney, N. J.; 10. M. C. Falco, Binney and Smith Co., New York City; 11. S. V. Smith, Binney and Smith, New York City; 12. Elise Ruffini, head, fine arts department, Teachers College, Columbia University, New York City; 13. H. Knapp, art department, Teachers College, Columbia University; 14. M. Marquart, supervisor of art, Newark, N. J.; 15. M. A. Larter, American Crayon Co., New York City; 16. Marguerite Tiffany, State Teachers College, Paterson, N. J.; 17. Dana P. Vaughan, director, School of Industrial Arts, Trenton, N. J., and president, Eastern Arts Association; 18. Florence Levy, Art Education Council, New York City; 19. Joseph Boltz, secretary, Western Arts Association; 20. Royal Bailey Farnum, Rhode Island School of Design; 21. Arthur Guptil, Watson-Guptil Publications, New York City; 22. W. B. Pollock, Fellowcrafters, Inc., Boston, Mass.; 23. Vincent A. Roy, supervisor, department of art education, Pratt Institute, Brooklyn, N. Y.; 24. William Longyear, supervisor, department of advertising design, Pratt Institute; 25. H. J. MacNeill, Binney and Smith Co., New York City; 26. K. C. Schenk, Birmingham, Prosser Co., New York City; 27. Edith Nichols, assistant supervisor, New York City Schools; 28. J. J. Leckie, Joseph Dixon Crucible Co., Jersey City, N. J.; 29. Wm. Burrell, Joseph Dixon Crucible Co., Jersey City, N. J.; 30. L. E. Parmenter, National School Service Institute, Chicago, Ill.; 31. J. Bowker, Milton Bradley Co., New York City; 32. J. F. Sharp, Wise, Corlett and Canfield, New York City. — Guests at The Related Arts Service Annual Meeting.



TODAY'S Victor Animatophones and Cine Cameras are maintaining the Victor reputation for quality of performance, simplicity of operation and sturdy construction. Thousands are in War Service all over the world.

WITH VICTOR, servicing the thousands of pre-war Victor Animatophones now in operation is as important as planning your post-war projector of tomorrow. Schools, Institutions, Business and Industry depend on Victor to maintain their irreplaceable 16mm motion picture equipment. Victor and Victor distributors have not failed them. Even under present conditions, when the demand for Victor production for war is so great, Victor parts and Victor service are available where ever Victor equipment is used. The unexcelled performance of old and new Victor 16mm equipment is being maintained.

YOUR FUTURE DEPENDS ON WAR BONDS YOU BUY TODAY.

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Home Office and Factory: Davenport, Iowa
New York (18)—McGraw Hill Bldg., 330 W. 42nd St.
Chicago (1)—188 W. Randolph

PUBLICATIONS

(Continued from page 26A)

tains a number of checkup and review tests. It also presents a useful glossary of the subject covered.

Auto-Mechanics — Course 5

By Ray F. Kuns. Paper cover, 309 pages, 5¼ by 7½ in., illustrated. School price, $1. The Bruce Publishing Co., 540 North Milwaukee St., Milwaukee 1, Wis.

This is the fifth book in this series of texts developed by the U. S. Armed Forces Institute. It covers the following chassis units: ride control, front axle, front system geometry, steering gears, the various kinds of brakes, brake service, wheels and tires, and maintenance service.

(Continued on page 32A)

Shop Equipment News

New Products — Publications

THE DI-ACRO RADIUS BRAKE

The Di-Acro Radius Brake, shown in the illustration, was designed and developed at the request of aircraft manufacturers who required a precision machine capable of properly forming duraluminum, chrome molybdenum, rust resistant and spring tempered alloys, and various other low ductile materials essential in the fabrication and production of aircraft.

This brake entirely eliminates the possibility of fracture or disintegration developing at the line of forming, while working the various materials.

The Di-Acro radius brake

The radii obtainable with this unit are in accordance with the predetermined standards recommended by the United States Army Air Corps for aircraft construction.

Case hardened and spring tempered materials that must be formed after heat treating can also be safely and economically worked with this new brake.

For a copy of the latest edition of the new 40-page Di-Acro Catalog, which carries complete information covering this new machine, write to O'Neil-Irwin Mfg. Co., Minneapolis 15, Minn.

For brief reference use IAVE—410.

STOCK HANDLING CART

To save steps and material handling in stockrooms, toolrooms, shipping departments, and numerous other operations, Lyon Metal Products, Inc., Aurora, Ill., has developed a handy stock handling cart. This cart is known as model No. 2000-11. It is 30 in. long, 16 in. wide, and 32 in. high overall. An extra center tray, and a desk accessory, which is 16 in. wide and 14 in. deep

Stock cart

with a 5-deg. slope, may be obtained at a small additional charge.

The cart is finished in Lyon green baked enamel and is shipped set up.

Additional information may be obtained from any Lyon dealer, or by writing directly to Lyon Metal Products, Inc., Aurora, Ill.

For brief reference use IAVE—411.

WET BELT SURFACER

The new WG-4 Wet Belt Surfacer developed by Porter-Cable Machine Co., Syracuse 8, N. Y., offers wet belt advantages to both line contact grinding and polishing, and to platen machining.

Heretofore, line contact grinding and polishing was available only in a dry machine. The heat and dust caused many complaints and costly delays. The dust is injurious to health and equipment. The heat generated causes distortion,

(Continued on page 30A)

Sheldon
... since 1898
Planning a laboratory is not merely a matter of selecting equipment, but a task that demands a high and specialized type of creative understanding, skill, and long practical experience. Only complete integration of every part, invisible as well as visible, can achieve maximum utility.
SHELDON vocational installations are a matter of public record. What we have done for others is a dependable index of what we can do for you. We'll be happy to work with you.
LABORATORY AND VOCATIONAL Furniture
E. H. SHELDON & COMPANY
MUSKEGON, MICHIGAN

UNCLE SAM IS LOOKING TO YOUR SCHOOL TO DO ITS SHARE IN THE BIG G.I. PROGRAM

MANY SCHOOLS throughout the country are doing a really magnificent job in training returned veterans for profitable peacetime occupations.

Let not any school feel it hasn't a big share in this important work. Every school is needed—and Uncle Sam wants every school to have all the machines, equipment and supplies necessary to do the job right.

Call on Brodhead-Garrett for what your school needs—yes, even for the planning of a training department, or the expansion of your present one. The Brodhead-Garrett catalog is brimful of all available machines, equipment and supplies—use it now in making up your order. And to avoid unnecessary shipping delays, or duplicate routine, please order all your wants at one time.

BRODHEAD-GARRETT CO.

"Supplying Defense Training Needs to Schools in All 48 States"

CLEVELAND, OHIO

A FITTING TO HELP KEEP YOUR P. I. T.s FIT!

Here's a good compact lesson for your Pre-Induction Trainees. Ask them to draw the correct orthographic views of this Intake Fitting for Centrifugal Pump. This kind of practice will be a great help in teaching them to read blueprints—a skill they'll need in the Service.

And to encourage your students to do their best, equip them with the best in drawing tools—Typhonite Eldorado drawing pencils. In these they will find uniform, accurate grading in every degree. They will also discover the solid, clean *Eldorado line* that assures easy-to-read blueprints. Your class will enjoy using Eldorado—and you'll enjoy the results!

DIXON'S
TYPHONITE
ELDORADO

SOLUTION: We will send you a free blueprint showing the solution of this problem. Write to the address below within thirty days. Specify Blueprint No. 128-J4.

SCHOOL BUREAU, PENCIL SALES DEPT., JOSEPH DIXON CRUCIBLE COMPANY, JERSEY CITY 3, N. J.

(Continued from page 28A)

warping, checking, cracking, etc.; it also turned over a burr.

Wet belt operation eliminates these disadvantages. The cool operation speeds the cutting, prevents loading of the belt, eliminates burring operations.

The 4-in. belt works a considerable area, while the 1½ h.p. motor of the WG-4 supplies ample power. This machine is equipped with a self-contained recirculating system and individual motorized pump.

For brief reference use IAVE—412.

BONDWOOD AN IMPROVED CASEIN GLUE

An improved casein glue — Bondwood — has been developed by the research laboratory of the Franklin Glue Co., Columbus 3, Ohio.

This glue is moldproof, and resists severe moisture and heat conditions.

Bondwood dissolves rapidly in cold water, 60 to 70 degrees, and is ready for use when mixed. It meets the exacting Air Force Specification No. 14122 as well as Federal Specification C-G-456, Navy Department Specification 52G8c and all other specifications for casein glue.

It is an excellent glue for outside sash and door or other products exposed to high humidity and extreme heat. A sample can be secured upon request from the Franklin Glue Company.

For brief reference use IAVE—413.

A NEW FLUX FOR TINNING CAST IRON

A new flux, known as Airco Hi-Bond, has been developed by Air Reduction Research Laboratories. It is designed specially for tinning cast iron prior to brazing.

This flux does not, however, preclude the use of, or take the place of the regular flux used for the actual brazing operation.

Hi-Bond Flux may be applied as a water-mixed paste, or as a powder, sprinkled on the surface, which has been previously heated to the required temperature. It is obtainable in 1-lb. containers.

For additional details address Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.

For brief reference use IAVE—414.

THREE-WAY ADJUSTABLE ARTIST'S BOARD

Esco's New 3-way adjustable artist's board can be adjusted for tilt and position and also has a swivel adjustment.

The base is made of sturdy oak, and suction cups hold it in place on desk or table. The drawing board is of 5-ply basswood with a one-piece drawing surface. Steel brackets assure positive locking to the work angle desired, and the board can be shifted on the base through a range of 8½ in.

For further information, address Engineering Manufacturing Co., Sheboygan, Wis.

For brief reference use IAVE—415.

TWO GRADES OF CARBIDE-TIPPED CUTTERS AVAILABLE

Armstrong Bros. Tool Co., 301-357 N. Francisco Ave., Chicago 12, Ill., announce that they have extended their line of Armstrong carbide tool holders and Armide carbide-tipped cutters. These tool holders, especially designed for use with carbide-tipped cutters, now come with "straight," "right-hand offset," or "left-hand offset" shanks, each in 7 sizes, while Armide cutters come tipped with carbides of two grades — Armide red for machining steel and Armide gray, for machining cast iron, brass, bronze, aluminum, and nonmetallics. All Armide cutters come ground to four standard cutter shapes, and in two weights, standard or heavy duty.

For brief reference use IAVE—416.

AN INSTRUCTIVE PERIODICAL

"Report," which is a bimonthly periodical published by The Cincinnati Milling Machine Co., Cincinnati, Ohio, presents some very interesting, instructive, and enlightening articles for those who use the firm's products. The September-October, 1944, issue, for instance, presents a very technical article on the subject of the true rake of a cutting tool. There are also articles on specifying and sharpening high speed carbide milling cutters, and an article on broaching.

The November-December, 1944, number presents articles entitled "Sawing on a Broach," "Grinding Machine Headstocks," and "Indexing in Three Planes."

For brief reference use IAVE—417.

NEW DATA ON MAINTENANCE WELDING

A six-page folder on *Low Temperature* welding rods for maintenance work has just been prepared by the Eutectic Welding Alloys Co., 40 Worth St., New York 13, N. Y. Eutectic *Low Temperature* welding serves well for solving maintenance welding problems, because the low temperatures involve fewer risks. No new equipment is required for these new low temperature rods; all that is necessary are the new Eutec-Rods which can be used with any oxyacetylene torch or arc equipment.

For brief reference use IAVE—418.

A COMPREHENSIVE CATALOG

Fellowcrafters, Inc., 130 Clarendon St., Boston 16, Mass., have just issued their new catalog covering leathercraft, plastics, beadcraft, wood turning, felt and cork craft, hand-loom weaving, fiber craft, block printing, silk-screen printing, woodcraft, pottery, carving, metalcraft and jewelry, and airplane model building.

The question of priority requirements are clearly explained.

For brief reference use IAVE—419.

BASIC PRODUCTION DIAGRAM

A 24 by 11-in. chart showing diagrammatically how the Wyandotte Chemicals Corporation, Wyandotte, Mich., manufactures the dry ice, chlorine, caustic soda, calcium chloride, soda ash, and sodium bicarbonate which it uses in the manufacture of its many chemical products, will be sent on request to science teachers. It makes an excellent bulletin board display piece.

For brief reference use IAVE—420.

A BOOKLET ON PLASTIC PRODUCTS

The 12-page illustrated booklet entitled *Plastic Molded Products* presents illustrations and descriptive items on the manufacture of the metal dies and the plastic products produced with them. The booklets are published by the

(Continued on page 32A)

Color Dynamics

Teach your students how this new scientific use of ENERGY IN COLOR *reduces eye fatigue, accidents and absenteeism—improves quantity and quality of production!*

TRAINING of skilled shopmen is no longer limited to teaching them about metals, machinery and methods. More and more, industry is recognizing the influence of physical and psychological factors upon workmen.

That is why so many educators in our industrial and vocational schools now include Pittsburgh's COLOR DYNAMICS in their courses.

This new science is based upon the simple reactions of human beings to the energy in color. In hundreds of industries where its principles have been applied during the past year, more work per man-hour and more man-hours per man have resulted.

Shop Executives are finding out that eye fatigue is an important contributor to the physical fatigue which slows down a worker. It frequently leads to headaches, "nerves," digestive upsets, depression and many other disturbances.

Where COLOR DYNAMICS is utilized eye fatigue has been lessened. Absenteeism has been reduced. Working conditions have been bettered. Quality and quantity of production have been improved.

If you want your students to be equipped thoroughly for their future jobs, begin teaching COLOR DYNAMICS as part of your regular school course. You can demonstrate its principles in your own shop by applying them on a machine or two.

Write today for a free copy of our book, *"Color Dynamics."* It contains a comprehensive explanation of these new principles and how they should be applied. Address Pittsburgh Plate Glass Company, Paint Division, Dept. IV-4, Pittsburgh 22, Pa.

PPG

PITTSBURGH PAINTS

PITTSBURGH PLATE GLASS COMPANY, PITTSBURGH, PA.

PITTSBURGH STANDS FOR QUALITY PAINT AND GLASS

ALL PENS POINT TO HIGGINS

Character in your lettering depends upon the character of the combination you choose; the **pen** and the **ink.** The accuracy of your finished job depends upon your choice of the ink that gives you complete control.

There's no "wheel of chance" when you use Higgins American Drawing Ink. With it you have complete freedom and facility with any type of pen or brush, precise performance that adds that intangible "something" achieved by all great artists and draftsmen — quality.

HIGGINS — the outstanding favorite of professionals and students for over 60 years!

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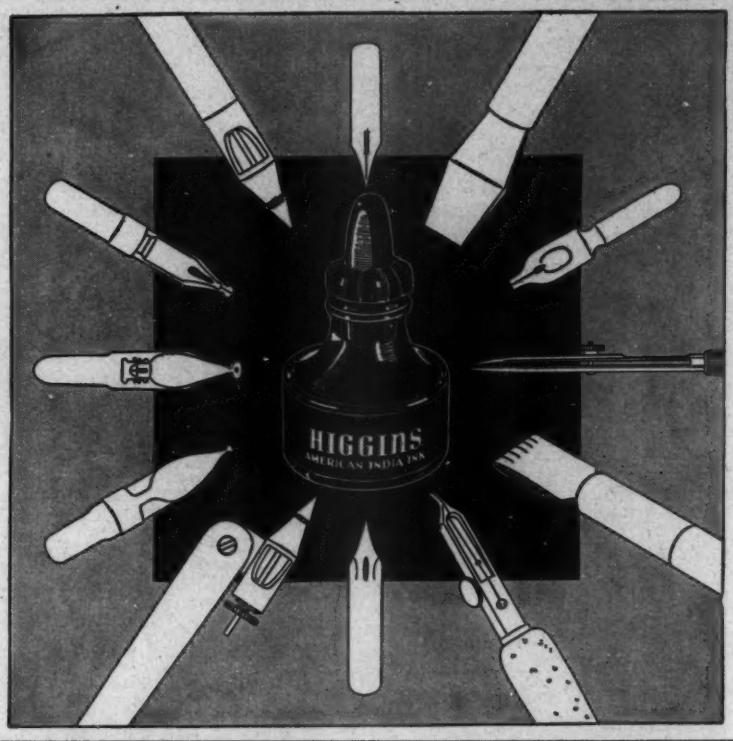

(Continued from page 30A)

Plastic Die and Tool Corp., 2140 S. Vermont Ave., Los Angeles 7, Calif.
For brief reference use IAVE—421.

FINISHES FORTY-FIFTH YEAR OF SERVICE

Major M. Poole, director of purchases of E. C. Atkins and Co., Indianapolis, Ind., just completed his forty-fifth year of continuous employment with the company. He was presented with a diamond studded Merit Award and the Award Certificate in appreciation of not only his long service but for the part he has played in the progress of the company through his expert knowledge of its products and his sound judgment and counsel in manufacturing methods.

Mr. Poole started as a boy in the factory. Having advanced through various manufacturing departments, he was placed into the cost department, and later in the purchasing department. In 1920 he was made purchasing agent of steel and other commodities used in the manufacture of saws and tools, and also office supplies. In 1940 he was elected to the board of directors and became director of purchases covering all purchases of the Indianapolis plant and its branches. One of his duties at present is to supervise the purchase of all materials used in the manufacture of armor plate and other war materials.

APPOINTED GENERAL MANAGER

Myron H. Buehrer, who for 12 of his 17 years with the Boice-Crane Company, Toledo, Ohio, served as sales manager, has just been elevated to the position of general manager.

SOME NEW APPOINTMENTS

The Ford Machinery Co., 1301 Toledo Trust Bldg., Toledo 4, Ohio, has been appointed agent for LeBlond Lathes and Cutter Grinders for the Toledo territory.

Nick Koppi, formerly of the LeBlond Sales & Service Dept., has been appointed manager of the Calco Machinery Co., Philadelphia 2, Pa. Calco Machinery Company is the agent for LeBlond in the District of Columbia, Delaware, Maryland, southern New Jersey and eastern Pennsylvania. This firm also will act as agent for the Carlton Machine Tool Co., manufacturers of radial drills.

CELEBRATED HIS TWENTY-FIFTH ANNIVERSARY

E. L. Schroeder, General Sales Manager and Director of Advertising for the Victor Animatograph Corp., Davenport, Iowa, has just finished his first quarter century with the firm.

He started as an apprentice in the dark room, was salesman, then manager of the lantern slide and stereoptician department. Then when the 16mm. cameras and projectors had become a reality, he was appointed director of dealer sales, and in 1934 general sales manager.

He is one of the oldest executives in point of service in the visual education industry.

ALLIED RADIO CORPORATION NAMED DISTRIBUTOR

The Allied Radio Corp., 833 W. Jackson Blvd., Chicago, Ill., has been appointed exclusive midwestern distributor for Creative Plastics Corp., manufacturers of terminal strips, bushings, specialized products, and the new Creative Insulating Grommet, which is made of phenolic plastic.

Descriptive literature may be obtained by writing to the firm.

SHELDON ACQUIRES VERNON LINE

The Sheldon Machine Co., Inc., Chicago, Ill., builders of Sheldon precision lathes and Sheldon arbor presses, announce the acquisition of the Vernon line of machine tools. This line includes the well-known Vernon horizontal milling machines, vertical milling machines and jig borers, 12-in. back geared shapers, and universal tool and cutter grinders heretofore built and sold by the Machinery Mfg. Co. of Los Angeles, Calif. All manufacturing of these machine tools has been transferred to the Sheldon plant in Chicago where production will soon start to permit deliveries shortly after the first of the year.

CHANGE OF ADDRESS

E. C. Atkins and Co., saw manufacturers of Indianapolis, moved their New York offices to 233 Broadway, No. 2279 Woolworth Bldg., New York 7, N. Y.

PUBLICATIONS

(Continued from page 28A)

Like its predecessors, it presents a glossary and numerous checkup and review tests.

Drawing for Life and Industry

By Daniel Green. Paper cover, 181 pages, 7¾ by 10⅛ in., illustrated. Price, $1.56. The Bruce Publishing Company, 540 North Milwaukee St., Milwaukee 1, Wis.

A textbook that grew out of a survey made by drawing teachers who were endeavoring to make their educational offering as meaningful as possible to every one of their students.

Applied Fundamentals of Machines

By Wendell H. Cornetet and Daniel W. Fox. Paper cover, 323 pages, 6⅞ by 10⅛ in., illustrated. Price, $2.50. Published by McKnight & McKnight, Bloomington, Ill.

One of a series of vocational science books prepared to bring more science and mathematics into the curriculum on the secondary level of education, and to help the student to prepare himself better for entry into his chosen vocational work, or, as is necessary at present, into the ranks of specialists who now make up our army.

The material is quite comprehensive and covers a wide range of subjects applicable both to industrial and wartime pursuits.

A Dictionary of Metals and Their Alloys

Edited by F. J. Camm. Cloth, 245 pages, 5¾ by 8¾ in. Price, $3. The Chemical Publishing Co. Inc., 148 Lafayette St., New York City.

This book defines and describes the various kinds of metals, gives their composition and characteristics, presents practical hints on their heat treatment, and describes how they may be plated and polished and finished. It also describes the composition of soft and hard solders.

The book also contains useful tables on densities, specific heat, boiling points, and the like.

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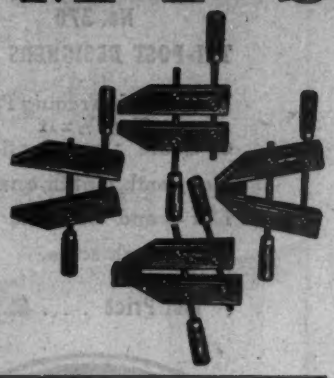

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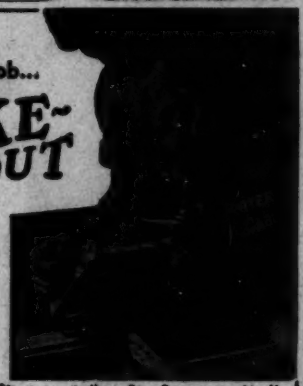

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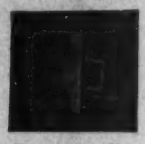

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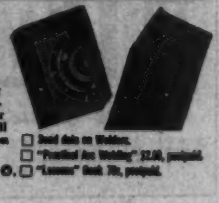

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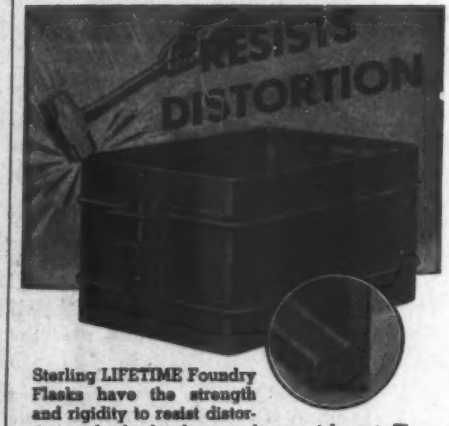

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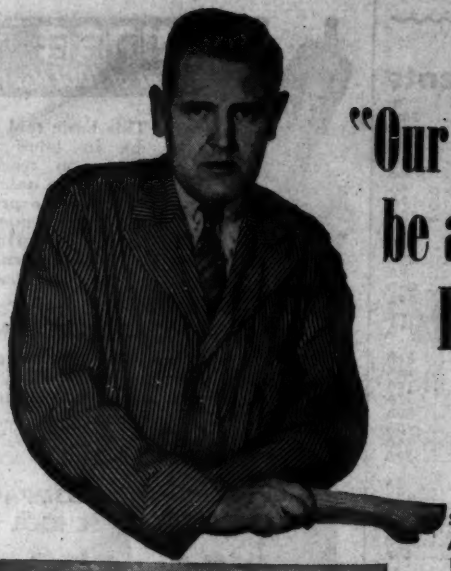

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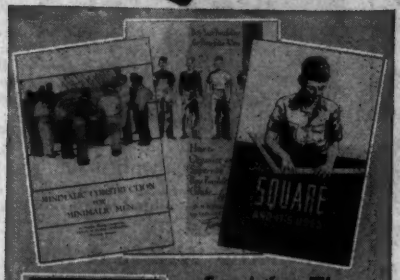

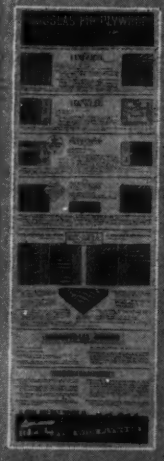

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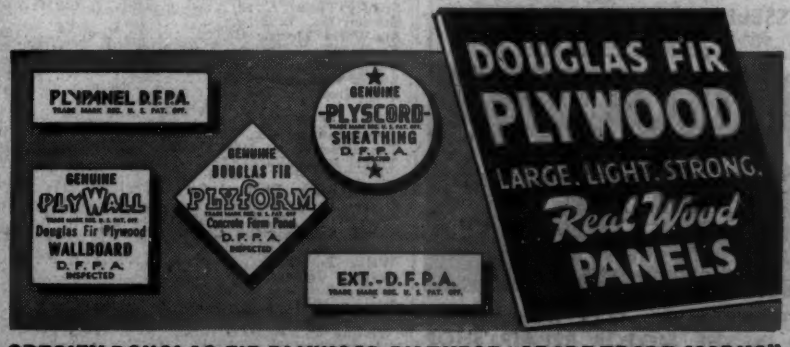
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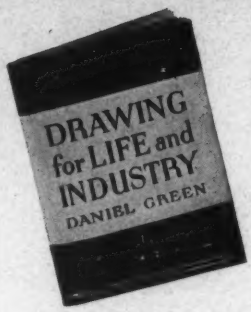

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